THE

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ELECTRICAL REVIEW.

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COMMUNICATION THROUGHOUT THE EMPIRE.

SOME years ago in these columns we urged with considerable persistency the importance of providing ample and cheap cable communication facilities between the Mother Country and all parts of the British Empire. Expressing our views thus in support of the appeals which were made by far-seeing Colonial statesmen, we desired to bring about the laying of additional cables completely under Empire control, so that rates might be settled according to the interests of all, and not prejudiced by the dividend-earning requirements of private companies, however great the debt humanity owed them for the pioneering service they had rendered over a lengthy period.

Since those days the facilities have been greatly increased by the laying of additional cables, by technical advance which has increased carrying capacity, and by the introduction and development of wireless telegraphy, while rates have been reduced again and again, with specially favourable terms for Press messages, week-end messages, &c. The lowering of rates was not found to reduce dividends, for in the wake of reductions came increased traffic; and while shareholders' interests did not suffer, the benefit to the Empire as a whole was unquestionable. How could it be otherwise? What is more essential to the binding together of the great family than full and prompt interchange of thought and news between its scattered members? what more important to the maintenance and development of commercial relations?

If such considerations as these seemed of paramount importance ten or twenty years ago, what of to-day? Our arguments of other days are strengthened immeasurably by what has been occurring during the past four years. The service rendered by the cables and by wireless has been of surpassing value—nobody will begrudge them the credit and honour that are their due. Some day, perhaps, when lips can be unsealed, we may be told the full story of how the great ocean cable systems and wireless services have stood the shock and strain of world war. If little is said to-day of the efforts and enterprises of those who control, operate, lay, and repair submarine cables, it is not because their achievements are unrecognised. But beyond all that they have done there lies the necessity for an ever-increasing efficiency and a more ample provision of facilities in the coming years. Whether we gain that goal by means of cables or by wireless or by both, the needs of the Empire will demand, unless we are greatly mistaken, a very large State policy.

The deliberations of the Canadian editors in London, under the auspices of the Empire Press Union, have brought the question of world communication to the front at the right moment, for, in our opinion, it must inevitably, and most appropriately, occupy a prominent place in our reconstruction measures. The relations between the Motherland and the Colonies and Dependencies are to-day warmer than at any previous stage of our history. We cannot suppose that what has been happening will lessen the need for facilities for speedy and cheap communication between us; on the contrary, we believe that there will be such a flow of messages—domestic, commercial and Press—in the coming years as we have never yet experienced.

The Empire Press Union since its formation in 1909 has sought to secure better facilities for the dissemination of news, and to this end it has advocated the further reduction of cable tolls, the extension of cables and wireless, better, quicker, and cheaper means of communication o

every kind. The Union's vision naturally goes farther than present actual achievement appears to place within easy reach. Mr. Robert Donald, in addressing the Canadian editors, did well, however, to let our guests know that we were in an ambitious frame of mind, wanting "to see and work for more cables, supplemented by wireless, a service of fast oil-driven ships, and an aerial express service of mails and passengers, which would bring Canada within twenty-four hours' journey of London." Our confrères with minds broadened by the wide sweep of the prairies of Canada appreciate that we here have no narrow conceptions of the possibilities of the next decade or two in lessening the great distances of the earth. There is everything to be gained by bringing the whole Empire family closer and closer together by means of cable and wireless communication, as was so excellently set forth in the Blue Book of the Dominions Commission. The Imperial War Conference has not lost sight of the question, and we trust that a policy will be adopted such as will ensure the establishment of an abundant mutual interchange of news for publication throughout the whole Empire, so that the present closeness of communion and intimacy may be continued for the common good after the war has been won. The War Conference last week passed a resolution, on the motion of Sir Joseph Ward (New Zealand), emphasising the need of "further material reduction of telegraphic rates."

Those who have had direct relations with the Colonies during the war when mails have, by force of circumstances, been irregular, and when cabling conditions due to code restrictions, cost, and other difficulties, have been a handicap standing in the way of transmission of information of service in the commercial defeat of the enemy, have reason to sympathise with the appeal which our Colonial brethren make for the Empire Press Union to use its influence "to secure better, quicker, and cheaper facilities for the dissemination of news throughout the Empire *from British sources*." The Union is also asked to ensure that "such co-operation as Governments may give shall be limited to assisting *in the provision of facilities*." What this means is that self-respecting British editors the world over desire to give a full service of useful and interesting news, that it shall be untainted and uncontrolled as to its character, transmission, and source, and that the Government will facilitate their efforts to that end by seeing that either the State or private enterprise, or both working together, shall provide sufficient British-owned cables or other means of transmission. Such a proposition inevitably raises questions concerning ownership and subsidies, and suggests the view that if low rates, even involving an actual loss on working, can promote the fullest possible circulation of intelligence, the Empire as a whole will find the direct and indirect results in development and solidarity, in common purpose, comradeship, and commercial prosperity, so great as to justify considerable capital outlay and substantial annual contributions.

In laying our plans for future reconstruction within these islands we are anticipating huge expenditures, but many of our ideas can only be carried into execution successfully if we consider them in conjunction with our schemes for the good of the whole Empire and for the utilisation of its vast resources for the benefit of all. Can we, then, in trying to contemplate and prepare for the whole situation afford to neglect the appeal for far-seeing enterprise in this particular matter? As the Hon. N. W. Rowell (Canadian Privy Council) said at last week's function in London, the Empire is held together by public opinion, and the Press has a great place to fill in preserving unity. What stronger justification than this could we require for ample Press cabling facilities and nominal Press rates everywhere?

During the war we have felt the lack of the proposed Imperial wireless chain. Sooner or later this matter must come to the front again in the form of practical proposals of some kind; the sooner the better! Electrical men who have made a lifetime study of the problems of submarine telegraphy, experts who have achieved such magnificent results in the wireless department, and manufacturers and contractors who have the staffs and equipments required for bringing schemes to maturity and fruition, will be eager to place their skill, experience, and facilities at the disposal of the State whenever the time is ripe for measures to be prepared for ensuring that, whatever the prospective needs of the larger life of the Empire may be in this connection, they shall be met.

Women in Central Stations.

REFERRING to the Home Office circular published in our "Notes" last week, a correspondent somewhat fiercely attacks its authors, and expresses indignation at their proposals. We cannot but feel that his remarks are based upon a too-hasty reading of the circular, which, to our mind, will not bear the construction which he places upon it. We do not think the Home Office intends to create difficulties on the score of the employment of women at night without express authority; in view of the urgent requests of the Government that women should be substituted for men wherever it was possible, such a course would be too inconsistent even for a Government department. In our issue of February 23rd, 1917, the positions in which the substitution of women was recommended were clearly defined by the memorandum issued by the Reserved Occupations Committee; they included *junior* sub-station attendants, assistant meter testers, cleaners, labourers, and meter readers. At the same time, the employment of disabled soldiers and sailors was advocated by the Committee. In a later communication the chairman expressly stated that the Committee had no intention to interfere with skilled men.

In the new circular, it is pointed out that the employment of women at night must cease with the end of the war, and, therefore, vacancies should preferably be filled by discharged men, "carefully selected and suitably trained." The necessity of adequate training before such men may be allowed to undertake dangerous work is emphasised.

Our correspondent, however, declaims against the employment of *untrained* men, a question which does not arise, at the same time stating that he has made many applications for discharged men! He misquotes the circular as saying that they are "specially suitable to such work," whereas the true statement was that the work was specially suitable *for them*, an entirely different thing. He also refers to work for which at one time technical education and three years' training was considered essential, conditions which everyone knows do not apply to the posts explicitly defined in the memorandum above mentioned. If he has not secured the necessary permission to employ women at night, that is his own fault, for the memorandum stated that permits would be granted on application; moreover, as he has made *bonâ-fide* attempts to obtain disabled men for this work, without success, it is still expressly left open for him in the present circular to obtain such permits. We feel sure that, on reconsideration of the circular, he will see that he has no valid ground for complaint.

As for the general question of employing disabled men wherever possible, this cannot but commend itself to every patriotic manager. These men have made sacrifices of which they will bear the burden to the end of their lives. We cannot do too much for them—nay, we can never do enough for them, for such losses are irreparable. Let us all, therefore, do everything in our power to enable them to carry on in civil life with comfort and contentment, regarding any inconvenience that we may personally suffer as a small part of our war service.

In his report for the year 1917, Mr. G. Scott Ram refers to the employment of women in electricity works in such posts as those mentioned above, and states that in some cases women are in sole charge of sub-stations containing running machinery. Mr. Ram, however, naturally regards the work as more suitable for disabled sailors and soldiers as a permanent occupation. We may point out that the very fact that women can successfully undertake such routine duties, so remote from their normal occupations, clearly proves (1) that the work is within the scope of discharged men whose injuries are not such as to incapacitate them in any essential respect, and (2) that the kinds of work in question obviously do not call for technical education and several years' training.

THE EDUCATION AND TRAINING OF ENGINEERING APPRENTICES.

By P. H. S. KEMPTON, A.R.C.Sc., B.Sc.

(Continued from page 51.)

In Great Britain.

In this country the systems of apprentice training which already exist or are in active contemplation may be considered under two heads. First, those in which the training is conducted in a works school at the expense and under the direct control of the company concerned. Secondly, those in which the apprentices are advised or compelled to attend evening continuation schools as a condition of apprenticeship, coupled in some cases with limited opportunities for the best students to win day-tuition at the expense of the company, but at an outside technical institute.

The only scheme which may be regarded as well past the experimental stage is the Admiralty scheme already referred to. This is a works school scheme, the expense and the control being administered by the Admiralty through the Director of Naval Education, and the schools are in every case within the dockyards.

The Westinghouse scheme associated with the name of Mr. A. P. M. Fleming is perhaps the best known and most successful works school owned and administered by a private concern. The British Westinghouse Co. was certainly the first commercial engineering firm to establish a course of vocational education for its apprentices with a school in the works and classes during working hours. At the end of last year the number of apprentices at these works was over 300, and during the past two years the courses have undergone some changes and developments, partly in connection with the improvement of the trade course syllabuses, partly with a view to broadening the basis of the education given. In his evidence before the Departmental Committee on Juvenile Education, and also still more recently in connection with the formation of the engineering training organisation, Mr. Fleming, who is the moving spirit in the Westinghouse school, has expressed himself strongly against the narrowing of the curriculum to merely vocational ends: "Vocational education cannot be separated from general education." At present the courses are as follows:—

Class I.	*Classes II. and III.*
Arithmetic.	Mathematics.
Drawing.	Drawing.
Elementary Science.	Mechanics.
General Course.	General Course.
Class IV. (Mechanical Engineering Apprentices).	*Class IV.* (Electrical Engineering Apprentices).
Workshop Materials.	Electrical Machines.
Workshop Practice.	Workshop Materials.
Class V.	*Class VI.*
Trade Subjects.	Draughtsmanship.

Only boys of special capacity are permitted to proceed to Class VI, and it is from among these chosen apprentices that promotions to the drawing offices are made.

The classes meet four or five hours weekly in works hours, and about 60 per cent. of the apprentices also voluntarily attend evening classes. The social side of apprentice life is fostered, and all social activities are arranged by the Apprentices' Association. These include a magazine, dramatic, cycling and rambling clubs, and organised sports. Apprentices are also encouraged to compete for 20-day course studentships at the Manchester School of Technology.

Among the courses of apprentice training involving attendance at outside technical schools some of the most successful have been instituted in connection with our great railways. In 1908 the Great Western Railway Co. inaugurated an apprentice training scheme in connection with its works at Swindon.

As a preliminary course all apprentices are expected to attend evening classes at the technical institute for instruction in elementary mathematics, mechanics, science, and drawing; at the end of each evening course, examinations are held, and, on the result of these examinations a number of free studentships are awarded. These free studentships are limited to 30 at any one time, generally in groups as follows. For a three years' course:—

First year course	...	...	15 students.
Second year course	...	...	9 students.
Third year course	...	...	6 students.

For each year's course there is a competitive examination, successful students passing from one year's course to the next; the age for entry upon the day studentship course is 17 years.

The course consists of day classes at the technical school on two half-days a week (9 hours) for 26 weeks (September to April). Wages are paid to the successful apprentices as if they were at work in the factory, and the Great Western Railway Co. pays all fees.

The courses each year consist of:—

Practical Mathematics.
Practical Mechanics.
Geometrical and Machine Drawing.
Heat.
Electricity.
Chemistry.

The best students in the final year's course are allowed to spend part of their last year in the drawing offices, test house or chemical laboratories.

Similar systems have been in vogue in connection with the large engineering firms on the N.E. coast and on the Clyde, and the following is a brief summary of a detailed scheme suggested by the Committee appointed to inquire into the question by the N.E. Coast Institute of Engineers and Shipbuilders. The committee consisted of Messrs. H. B. Rowell, M.I.C.E., A. Harrison, M. H. Horsley, G. B. Hunter, M.I.C.E., M. C. James, D. B. Morrison, P. Sharp, B.Sc., Gerald Stoney, B.A., F.R.S., R. J. Walker, C. Williams and E. Smith, together with Principal V. A. Mundella, M.A., B.Sc., and Prof. J. J. Welch, M.Sc., and Prof. R. L. Weighton, M.A., D.Sc.

They recommended that in view of the near reform of our educational system the scheme should be put into operation at the earliest possible moment.

1. The N.E. Coast Institute of Engineers and Shipbuilders to be delegated by the employers in engineering, shipbuilding, &c., to act with the local authorities in the development of apprentice training in technical education.

2. The local junior technical and trade schools to be used as a preliminary training ground for prospective apprentices.

3. An advisory committee of representative employers and employés to be associated with the management of these and other technical schools.

4. On entry to apprenticeship the boys to be selected:—

(*a*) A small percentage to spend half the week at the works and half the week at the local technical college for a two years' course.

(*b*) The remainder to be liberated from the works for at least two half-days a week, and if possible three, for attendance at day continuation classes up to the age of 18, with no deduction in wages.

5. Such subjects as Citizenship and English to be included in the curriculum of both classes (*a* and *b*) above, together with usual technical subjects.

6. Suitable arrangements to be made for transfer of apprentices (*a* to *b* or *b* to *a*) as necessary.

7. All facilities under this scheme to be forfeited by apprentices showing continued lack of interest or application.

It is interesting to notice that the above scheme is designed to apply to all the engineering and shipbuilding apprentices on the N.E. coast, where, according to a recent statement by the Duke of Northumberland, "over one-half of the kingdom's warship and mercantile tonnage, and over one-third of the kingdom's total output of marine engines" are produced.

Messrs. Armstrong, Whitworth started an apprentices' school in connection with their shipyard three years ago, but here the attendance has been voluntary. Its progress has been such, however, that the number of apprentices attending the classes is now nearly double the number in 1915.

In our Colonies.

Developments in apprentice training have proceeded with great rapidity in our colonies, and while we are not aware of the existence of any works schools, yet the system of co-operation with the local educational authorities has a wide vogue. In Durban, a system similar in many respects to the one described above in connection with the G.W.R. Co. is in operation, while a more elaborate course is run in connection with the Australian Government under which the railway and naval apprentices attend classes at the Melbourne technical school.

The following extract from the regulations of the Commonwealth Railway Commissioners indicates the comprehensive and compulsory nature of the training:—

"Every apprentice shall immediately enrol himself as a student at the (Melbourne) college and shall attend at such college the classes of instruction appertaining to the trade to which he may be apprenticed or such other classes as the Commissioners may direct, at such hours of the day or night as may be prescribed, during the complete course of training which shall extend over a period of three years."

"Every apprentice shall provide the books, drawing instruments, &c., required at the college at his own expense, but the Commissioners will pay the college fees as well as the wages of the apprentice for such portion of the ordinary hours of duty as he may be required to attend at the college."

Exactly similar regulations govern the instruction of naval apprentices including artificers, torpedo artificers, armourers, carpenters, and shipwrights, except that in their case the course extends to four years.

The curricula and time-table are given below:—

For Railway Apprentices.

First year attendance	...	5 hours per week.
Second year attendance	....	5½ hours per week.
Third year attendance	...	8 hours per week.

First year Course.—Elementary science, mathematics, projection, and geometry.

Second year Course.—Mathematics, engineering, drawing, applied mechanics (with alternatives of geometrical drawing for some apprentices and electricity for others).

Third year Course.—Mechanics, steam, electricity, engineering drawing, algebra, and solid geometry (with alternatives of trade instruction and drawing for some apprentices).

(To be continued.)

Arbitration.—Arbitration is proceeding between the Yorkshire Section of the National Amalgamated Union of Enginemen, Firemen, Mechanics, Motormen, and Electrical Workers, the Halifax and District Engineers' and Firemen's Associations, and the National Engineers' Association on the one side, and the Woollen and Worsted Federation of Yorkshire on the other side, in regard to wages and hours of labour.

RECONSTRUCTION IN GERMANY AND AUSTRIA.*

Electric Power Supply.

Proposals for the centralisation and development of Electric Power Supply in Germany have received a great deal of attention, and various schemes have been put forward. Reform of the present system has been urged on four grounds:—

1. Economy in coal and its transport.
2. The possibility of using a State monopoly of electricity and of coal as a source of revenue. (This has been opposed on the ground that the industrial necessity for cheap power would not allow the State to make much profit out of such a monopoly.)
3. The importance of plentiful and cheap power in industrial reconstruction, especially in the development of the electrochemical and electrometallurgical industries.
4. The necessity of exploiting all the water-power resources of the country.

For some time past the general trend of opinion has been in favour of increased State action. As early as July, 1916, Dr. J. Klingenberg, in a speech at the War Conference of the Verband Deutscher Electro-Techniker, urged that the generation of electrical energy should be nationalised, while leaving the distribution and the retailing of power in the hands of existing undertakings. He suggested that the Prussian Government should erect 25 to 30 large power stations, and inter-connect them by long-distance circuits. He calculated that the total cost would be 900 million marks, but that when the system was in full working order there would be a return of 9.56 per cent., which, after deducting 5 per cent. for interest on invested capital, would leave a clear profit of 41 million marks per annum to the State. He opposed the distribution of energy by the State on the ground that that part of the electricity business, especially the extension of clientèle, required an adaptability to varying conditions which would be more likely to be found in the existing non-State bodies than in a Government department. He also contended that the State would be expected to extend uniform treatment to all users of electricity, whereas the best business interests required that there should be some scope for discrimination in rates. By confining its action to the generation of electricity the State would interfere as little as possible with existing rights, and it would create a desirable intermediary between itself and individual consumers.

Another expert, Dr. Voigt, also advocates centralisation. He, however, has been in favour of a short distance scheme in place of Klingenberg's long-distance one, and he believes that electricity works would not be able to enter into sufficiently favourable rate agreements with large consumers unless they produced electricity. He thinks, therefore, that the existing large works should be extended and interconnected, and that the desired centralisation should be reached by gradual development.

H. Bueggeln believes that in spite of the usually unwieldy methods of State administration, a form could be created which could hold its own when compared with private concerns. He urges that, in the case of plans for new installations, low working expenses and economy and security should be the first consideration, and, if they can best be attained by a costly installation, such an installation should be preferred to a plant involving smaller capital but higher working expenses. He considers that power stations should be linked up, but believes that turbo-generators of 15,000 to 20,000 kilowatts are the most economical, and that there is no advantage in having larger units.

There has also been a considerable amount of discussion regarding the question of a State monopoly of coal and electricity for revenue purposes.

Professor Ballod is in favour of a State monopoly on grounds of fuel economy as well as on financial grounds. He thinks that all the railways and all industrial and agricultural plant should be electrified, and that electricity should be produced in large plants of 100,000 kilowatts and distributed by high-tension mains at 100,000 volts. He calculates that by electrifying the railways it would be possible to save at least one-third of the coal consumed by them, which amounted to about 20 million tons in the year immediately before the war. He urges that the State should endeavour to reduce home consumption of coal by one-third, and should reckon to make most of its profit on coal for export. The cost of coal should not be increased to home industries, nor should the State attempt to make much profit out of electricity, as its aim should be to provide cheaper not dearer motive power.

Professor Liefmann, of Freiburg, points out that owing to the difficulties which would arise regarding the indemnification of existing works, and the necessary arrangements with regard to the numerous schemes already taken up by the individual States, an Imperial electricity monopoly could not be expected to provide a large revenue immediately after the war. He considers, however, that the existing chaos in the supply of electricity would only be reduced to order by an Imperial monopoly, and that the scheme should be carried through from the point of view of national economy, if not for financial reasons.

Local jealousy has up to the present prevented any Im-

* Board of Trade *Journal*. Abstract.

perial action, but progress has been made in most of the individual States. Bueggeln gives some interesting information about the existing state of affairs in Württemburg. He says that in addition to the important works of Stuttgart, and Esslingen, there are about 270 very small and medium-sized works, of which 260 produce their own electricity; of these only 58 work without water power. The total capacity of all the plants is only 100,000 KW. When water was employed to generate energy the great bulk of it flowed away unused, owing to the lack of a coupling circuit for the whole country into which the power stations could direct their surplus energy.

The Württemburg Central Office for Industry and Commerce is arranging a scheme for the consolidation of all the electricity works for the purpose of the uniform distribution of energy. The State is to participate in the administration of the scheme, but the idea of constituting a monopoly of the industry has been rejected.

In Saxony the Elektro Verband (the federation of the municipally-owned electricity works) prepared a scheme for the joint supply of electricity to its members and for the erection of two great power stations, but the State decided that the proposed rates still further increased the favoured position of large cities, and decided to take over the scheme and carry it out in all its essentials under State control. The Saxon Second Chamber has voted 40 million marks for developing State electricity works on condition that light and power should be furnished at cheap rates for industrial and commercial use.

A scheme for the development of Bavarian water power has been prepared; the output of energy is estimated at 21½ million kilowatt hours. The work will be begun three months after the conclusion of peace, and it will probably take from four to five years to complete. A syndicate has also been formed to exploit the water power of the Lower Inn. The available power is estimated at 200,000-H.P., and the syndicate will undertake the necessary preliminary work. The syndicate has two million marks at its disposal for this preliminary work. The Deutsche Bank considers that about 150 million marks will be necessary.

In Prussia the Government policy was foreshadowed in February, 1917, when the Minister of Public Works declared himself in favour of the principle of State control of electricity. He pointed out that the broad supply belt which stretched from the North Sea to the Main was already under State control, and that the Government had succeeded in supplying cheap electricity without injuring the interests of provinces, communes or cities. He said that if the State intervened and created large power stations at places where transport requirements were reduced to a minimum, it would be able to supply energy so cheaply that third parties would often find it profitable to turn their works into distributing centres, and, while distributing energy cheaply to their customers, they would still be able to make a good profit. The Hanover Steam Power Works Bill authorises the Government to appropriate 13 million marks for the erection of a State power station driven by steam near Hanover. The work will be begun after the war, and will be in operation at the latest two and a-half years after the declaration of peace. When the works are in operation there will be a complete State area of electricity supply from Bremen to the Main, with all the economic advantages of interconnection and uniform pressure. The output will amount to 50 million kilowatt hours, and will be capable of further development. The State Governments will co-operate in developing an adequate supply, in the removal of unsatisfactory conditions, and in obtaining the greatest possible uniformity and economy in the supply of new areas. The Government intends to take over as a general rule the generation and transmission of energy, but not its distribution to consumers. There is no intention of making municipal or private works close down, but the area of supply of distributing works will be carefully defined in order to exclude unnecessary competition and to secure an adequate supply for the whole area.

In Austria very much the same general lines have been followed as in Germany. The Government's programme was outlined in a speech by the Premier in September, 1917. He said that there would be a great development of water-power, and that the electrical system would be placed under the centralised control of a special department of the Ministry of Public Works. An Electricity Bill to give effect to the Government's proposals was introduced by the Minister of Public Works on February 5th, 1918.

The Minister emphasised the importance of developing electricity, and the backward state of Austria, especially with regard to the use of water power. He referred to the lack of method in the electricity system, and to the large number of small works; 59 per cent. of the works had a generator capacity of only 100 KW., and only 1½ per cent. had a generator capacity exceeding 5,000 KW. Those big works, however, represented half the total capacity. Progress must be made on the line of large works and their interconnection. The object the Government had in view was a uniform and economical supply of electricity. The State would give financial help, which would take the form either of State participation in capital advances, permission to issue debentures free of tax, or a guarantee to take a certain amount of energy and to interconnect stations. The technical perfection of stations would be insisted upon, differential treatment of consumers would be prohibited, as would any monopoly of installation by the electrical undertakings, tariffs would be supervised, and the State would take a percentage of the profits. The undertakings would retain 6 per cent. on their invested capital; of the profits between 6 per cent. and 10 per cent. the State would receive one-third, and of those above 10 per cent. the State would receive one-half. In order to make the nationalisation of the electricity supply possible the right to redeem would be incorporated in the Act. The Bill contained provisions for an investigation to be made regarding private works in order to prevent them interfering with the plan for a united system, and also provided machinery for the setting up of an Electricity Commission.

The Ministry of Railways has issued, in connection with the Government programme, a pamphlet on "The Preparatory Measures of the Austrian State Railway Administration for the exploitation of Water Power and the Electrification of the Main Railway Lines," which contains, amongst other things, an estimate that the Alpine water power amounts to 3,000,000 H.P., of which only 8 per cent. is now being used.

The Hungarian Minister of Commerce has ordered an Electricity Bill to be drafted on similar lines to those of the Austrian Bill. The Transition Ministry has in addition worked out a plan for dividing Hungary into districts, each of which will be served by a central electrical station worked by water power. A special energy station of the ministry will deal with the utilisation of water power and natural gas.

THE DYNATRON AND PLIODYNATRON.*

By A. W. HULL.

THE dynatron belongs to the kenotron family of high-vacuum hot cathode devices. It resembles the kenotron and pliotron in construction, but the action is fundamentally different. The kenotron rectifier utilises the uni-directional property of the current between a hot and cold electrode in vacuum. The pliotron utilises the space charge property of this current, which allows the current to be controlled by the electrostatic effect of a grid. The dynatron utilises the secondary emission of electrons by a plate upon which the primary electrons fall. It is, as its name indicates, a generator of electric power, and feeds energy into any circuit to which it is connected.

The dynatron is a vacuum tube containing a hot filament, a perforated anode, and a third electrode called the plate. The anode is placed near the plate and between it and the filament, and holes in the anode permit electrons from the filament to reach the plate. The anode may be in the form of a perforated cylinder, a spiral of wire or cylindrical network of fine tungsten wire. When the voltage of the plate with regard to the filament is sufficiently raised, the electrons strike the plate with a velocity high enough to cause the emission of secondary electrons from the plate. These secondary electrons are attracted to the anode, which is kept at a more positive potential by a battery connected between the filament and the anode, and the net current received by the plate is the difference between the number of electrons that enter and leave it. As a result the characteristic relation between the current and the voltage is denoted by a curve for the current that rises from zero to a maximum of about 50 volts, thence decreases through zero at 100 volts to a negative maximum at about 150 volts, and then becomes positive again. It will be noted that in the region between 50 and 150 volts the current decreases with increase of voltage, and the tube has the property of possessing a "negative resistance."

This feature of the tube renders it suitable for many important uses. If connected in series with a circuit containing a positive resistance the total resistance may be made as small as desired, and a small change in the voltage applied to the whole circuit will cause a comparatively large change in the current flowing, *i.e.*, the circuit acts as a voltage amplifier. If connected in parallel with a circuit containing positive resistance the total conductivity of the circuit can be made as small as desired, and the circuit then acts as a current amplifier. If connected in a circuit containing resistance, inductance and capacity, the damping may be made very small, so that impressed oscillations may persist for a very long time, or the damping factor may be adjusted so as to be negative, in which case continuous oscillations will be set up. Oscillations of this type will arise if $Rr = L/C$, where R and r are the resistances of the circuit and dynatron respectively and L and C the inductance and capacity of the circuit. Tests are described that confirm these results, and it is found that a dynatron short-circuited by a couple of turns of heavy wire will generate at a frequency as high as 20,000,000 cycles a second or as low as 1 cycle a second. The wave-shape follows a sine law when $Rr = L/C$, and is distorted when this relation is not fulfilled.

The characteristics of the tube are greatly modified if a magnetic field is caused to act parallel to the axis of the anode. The spirally moving electrons are then stopped to a

* *Proceedings* of the INSTITUTE OF RADIO ENGINEERS. Abstract.

greater extent by the anode, and fewer electrons reach the plate. Furthermore, the field restrains the secondary electrons from leaving the plate. As a result the tube passes from having a negative resistance to having a positive one.

If an electrostatic field is impressed by means of additional plates inserted into the tube, the negative resistance of the tube may be controlled by the strength of the electrostatic field. The tube thus controlled is called a pliodynatron, which may be used as a powerful amplifier, as a radio-generator, or, together with a transmitter, as a radiophone for wireless telephony, or as a sensitive detector in a telephone receiver circuit. A number of these applications are described in detail.

THE STORAGE OF BITUMINOUS COAL WITH REFERENCE TO ITS LIABILITY TO SPONTANEOUS COMBUSTION IN STORAGE.

By JOHN H. ANDERSON.

(*Abstract of paper read before the* Institute of Marine Engineers, *June*, 1918.)

Owing to various reasons, probably more coal is held in reserve at the various works throughout the country at the present time than there ever has been before, yet in how many cases are proper precautions taken to prevent loss either by deterioration or even by fire.

The writer has been called to examine heaps of coal that were on fire, and the results of these examinations have supported the practice embraced in the following lines. On carrying out the suggestions given, no further trouble was experienced. Although these notes are based on a pile of 16,000 tons, this quantity is a very small portion of the tonnage deposited, from which the general experience was gained. Some of the heaps have been deposited over three years. This pile was selected as an example due to its being all small coal, consisting of several kinds—washed and otherwise—some of a supposed dangerous kind for storing, containing a lot of very fine smalls. All the material was of a bituminous nature, fairly high in volatile matters, and the whole was stored in the open, therefore it had to undergo all effects due to atmospheric conditions. As the storing of the coal was considered a temporary measure, very little preparation was done to the site, which was on marsh ground in its original state of alluvium deposit. The depth of the heap was increased here and there for experimental purposes, and owing to the difficulty of securing the particular coal one would desire to store, we made this heap up with various kinds which one would scarcely store under ordinary circumstances. Under these conditions extra carefulness was exercised. Temperature readings were taken at 14 different places nearly every day, at the same depth from the surface, and we occasionally took readings at the vent pipes, of which there were fifty in this heap. To find the hottest part of the heap, whenever there was anything doubtful, we took readings at every foot, from top to bottom, at certain places. The maximum and minimum temperature of the atmosphere and the kind of weather was also recorded.

From previous experience we found the warmest place to be between 6 and 8 ft. deep from the surface, so from this we established a depth of 7 ft. as the standard depth to record temperature. Occasional check readings and all warm places (taken at every foot) was done in addition, personally. Generally speaking, I found the readings taken were very trustworthy; the men took great interest in the work. The temperature tubes were ¾ in. or 1 in. gas tubing, and driven from the top to the bottom of the coal. They should be long enough to project 2 or 3 ft. above the coal, and each tube had a numbered metallic label fixed on, so that it could easily be recognised by whichever person recorded the readings.

Regarding vent pipes, in most cases these were old scrap tubes about 8 ft. long and 3 to 4 in. in diameter. Four holes were punched in the pipes about every 8 in. or so, stabbed from the outside with a square-tapered punch to about ¾ in., thus leaving a burr, which prevented the coal going down inside the tubes. To facilitate the driving into the coal, the ends of the tubes were flattened, chisel shape, just leaving an aperture of about ¼ in., thus preventing the accumulation of water, and allowing for further venting area. The vent pipes were driven down to the 7 ft. mark leaving about a foot projecting above the coal. On this a distinctive number was painted, to which temperature readings were credited similar to the temperature pipes.

The plan of the heap is a triangular-shaped figure with a surface area of about 46,000 sq. ft., with an average depth of 13½ ft. and a maximum depth of 16 ft. The actual pile consists of North Country, Scotch and Yorkshire coals.

Although it would be best to deposit coal during cool, dry weather, no choice could be taken. Some coal was deposited during very hot weather, while other was deposited in heavy rain; again, some of the material was quite dry when discharged from the steamer, while other was as wet as it possibly could be, due to the drainage to the bottom of the hold during the transport of washed coal.

Bearing these conditions in mind, and also that the heap is in the open, one gets as near as possible to the maximum difficulties one could expect as regards the liability to create spontaneous ignition and general depreciation of the heating value of the fuel when finally consumed in the furnace, that is, if care is not observed in the treatment of the pile during storage.

It is generally well known that coal is in a state of combustion at all temperatures, due to its absorption of oxygen from the atmosphere. When the coal is at a low temperature this oxygen absorption is very little, therefore there is not much heat generated. On the other hand, heaps may be composed of small coal, which may be so dense that there will not be sufficient paths for the generated heat to escape; the consequence is that this heat gathers, thereby increasing the temperature of the coal, and incidentally, due to the increase of heat, it increases the rapidity and capacity for further oxygen absorption in a given time, thus giving off more heat in a given time than when the heap was cooler.

By taking periodical readings of the heat of pile, and comparing them with previous readings, one gets ample warning to prevent a fire. We made 90 deg. Fah. a warning temperature. When this reading was obtained at any place four further temperature pipes were driven down north, south, east and west about 10 ft. from the warm pipe. The next day the readings of these four pipes were carefully noted. The highest one would then be made the centre, and further pipes would be put down in this direction. The idea is to locate the source of heating, which may be communicating only a portion of its heat to the standard temperature tube. When this warmest place was found an additional vent pipe would be put in there, which generally arrested the rise of heat. We would then pull out the smaller temperature tubes. We made 100 deg. Fah. a danger reading—that is, if the insertion of a vent pipe failed to arrest the rise of temperature—but let it reach 100 deg. Fah. We gave orders for a trench to be dug, one foot deep, on every occasion. Thus if the daily readings were at 100 deg. Fah., say, for three days, then this spot would be found trenched three feet deep. Originally this danger temperature was 95 deg. Fah., and on four occasions we trenched at one place. This was the only trenching done in the heap.—about 10 tons of material removed in all. At no time did the readings of this pile reach 100 deg. Fah.; probably the trenching on this occasion may have been unnecessary if additional vent pipes had been inserted. However, this was the hottest part of the pile throughout the whole period. This part was in the neighbourhood where the coal was deposited to a depth of 16 ft.

The handling of the coal so many times makes a great difference in the appearance of same when it arrives at its destination, and with some of the more friable coal quite a large percentage of smalls are made from the coal, which was all screened pieces at the colliery heapstead. The liability of this small coal to create spontaneous combustion is very pronounced, both from its size and also from it closing up the paths, whereby the heat generated would otherwise escape freely to the atmosphere. This will be better understood by considering the greatly increased area of coal that is exposed when a lump is broken up; therefore, more surface to absorb oxygen. There is one safe height that must not be exceeded, but as there are other factors to be taken into consideration, it will almost be impossible to fix this safe height for every heap. The height of pile can be increased providing means are taken to vent it, the more it is vented the higher the heap can be piled. Generally speaking, 12 to 14 ft. is about as much as one should deposit small graded coals. Nine to 12 ft. for unwashed mixed coals. For slacks it depends a great deal on the composition of same. Two heaps of this material we allowed to rise up to 120 deg. Fah. before moving it. These heaps gave considerable trouble at the height of 10 ft. Eventually we reduced this height to 6 ft., when even then its tendency was to increase in temperature. My opinion of the cause of trouble was bad washing of the material; thus after a shower of rain the shaly-like material formed a sort of plastic mass with the coal, practically preventing any escape of the heat. Heavy clouds of vapour rose from this when it was grabbed. As a rule little trouble is experienced with the storage of large coal, but in the event of a fire great difficulty will be experienced in putting it out owing to the ready access of oxygen for supporting combustion. Care should be taken not to make any smalls when depositing this coal, and if possible the coal should be selected that will weather best, otherwise that on the top will crumble up and fill up the interstices underneath.

The sun, rain and frost play a very important part in disintegration. I have split many a piece of coal that was exposed to the sun for some time by simply pouring a glass of water on the lump. Again, the brassy streaks or pyrites, decompose, resulting in their swelling and causing a certain amount of breakage of the piece. Personally, I am inclined to believe that they play a very important part in the storage of coal, particularly in conjunction with rainy weather, thus being an incentive to set the pile in active oxidation.

I had rather an anxious time for some weeks with several heaps, due to the rain during last summer. Up to this time all our heaps were in a perfect state of balance regarding

the escape of heat as it was being generated, but soon after many of the readings began to rise. Vapour rose quite freely out of the vent pipes, and continued to do so for several weeks afterwards. Several additional vents were inserted, and we trenched at one place where the highest readings were obtained. On close examination during trenching we found that active oxidation of the pyrites had taken place, and that quite a layer of fine pyritic shale had formed, thus practically sealing the coal underneath. This material, I suggest, is from the weathered, disintegrated coal from the top, which probably had been washed down with the rain; as it further oxidised it would swell and close up still more.

Regarding the nature of coal and its liability to heat, generally speaking, I find that the geological age is a fair guide, the anthracites being the safest to store and the lignites the most dangerous. A good guide is the weathering effect on a sample rather prominently exposed and occasionally moistened with water by hand, that which readily crumbles up being the most dangerous. But, of course, a great deal depends on the composition of the coal, considering the impurities and foreign material that may be mixed with it.

Anything that ignites at a lower temperature than the fuel should be kept out of the heap. In case of fire, although plenty of water should be available to quench out a fire if flames were seen issuing, it is better to dig all round the fire, and remove the hot coals away from the heap.

If it were possible to get the water to the fire, quite a lot of it would get heated; it would gravitate to the bottom of the heap, and there spread out. This heated water may then just be sufficient to set the whole heap into active oxidation. Again, some of the steam formed may be decomposed and assist the formation of a flaming gas. I certainly should not flood a burning heap of coal except when there was an actual fire that could not be treated otherwise.

As a rule, the greatest danger is up to about three months from the time of taking the coal from the pit.

It must be clearly understood that the term "vent pipes" used in this paper does not mean ventilating pipes; but that they are used purely and simply as escape pipes for the hotter gases in the heap.

The losses in calorific value as a fuel are exceedingly small, particularly if stored in a method reducing the exposed area to the atmosphere, such as shown on the plan rather than in heaps of a triangular vertical section, or coned heaps. The losses are the surface weathering, plus that given off as heat from oxidation. If the heaps are kept cool, this latter item can be neglected; as regards the former, this could be overcome by covering. But this would be rather costly for large heaps; it can be minimised by choice of coal. These losses are more apparent than real. There is a further loss, but this is mostly lost shortly after the coal is mined, in a gaseous form, and it can be neglected so far as storage is concerned.

Generally speaking, the elements lost in storing are those which in most cases are thrown away by imperfect combustion in the furnace, and I believe if the stoking of stored coal was given more consideration, practically the same results would be obtained from an evaporative point of view, as from ordinary coals.

An allowance must be made for interest on capital cost of stock, rent of space occupied, together with expenses of handling, and, of course, insurance of the whole. This latter item is quite nominal providing systematic methods of storing are employed, as suggested in this paper.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

National Electric Power Supply.

In returning to this subject I wish to deal with one point which seems to be the sheet-anchor of many advocates of the scheme; I refer to the question of the conservation of coal.

The President of the Board of Trade, replying to the deputation of members of the Trade Union Congress Parliamentary Committee, referred to the Coal Conservation Sub-Committee's report and the statement that a national scheme would mean a saving of 50 million tons of coal and 100 millions sterling a year, and went on to say what a colossal waste this was. No mention, however, was made of the colossal sum that would need to be expended to make such saving possible.

Now let me deal with the first point, viz., the saving of 50 million tons of coal per annum. This amount is arrived at by taking all the coal consumed in power production, including factories, mines, *and railways*, assuming the average consumption at 5 lb. per H.P.-hour, and assuming also that all such concerns will in future take their supplies in the form of electrical energy from large power stations, and that the coal consumption under such conditions will be 1½ lb. per H.P.-hour.

You have first of all to persuade all the users, including the railways, to consume electricity instead of coal, and this will be a prodigious task; to quote an old proverb, "You can lead a horse to the water, but you cannot make him drink."

Many factories there are whose coal consumption is considerably lower than 5 lb. per H.P.-hour, arising, no doubt, from the good load factor of their works, and from this point of view they are most desirable customers for the power-station manager, but, from their existing low costs, will be most difficult to persuade to change.

Not the remotest evidence is vouchsafed as to the length of time or the probable cost that will be involved in installing electricity for all factories, mines, and, not least important, railways.

No proof is given that electricity can be supplied to all these concerns on a coal consumption of 1½ lb. per H.P.-hour; transmission and distribution losses will certainly increase this figure very considerably if the *whole* of the coal-consuming concerns are to be supplied with electricity from the proposed super-power stations.

Therefore, when the actual number of concerns whose coal consumption will be affected is considered in conjunction with the actual consumption that will be realised under the new conditions, we shall arrive at a figure nearer five than 50 million tons as the saving in coal.

Then, as to the second point, viz., the saving of 100 millions sterling; according to the Coal Conservation Report, this is arrived at by various assumptions, seven in all. It will be sufficient to take three of them, which all labour the same point, and that is the extended use of electricity for domestic purposes. Now, I am not one to belittle my own wares, but the problem must be faced fairly and squarely, and, even with the super-power stations, I cannot possibly conceive the extension of the domestic supply to the extent of realising the saving in coal, &c., put forward in the report. To anyone who has actually been up against the whole details of supply for domestic purposes the idea is fantastic. The supply has been as cheap under the "Point Five" Tariff as it is ever likely to be, and even this tariff was not sufficient to cause anything approaching a rush for supply.

Equally exaggerated are the claims under the other headings, so that the claim of 100 millions sterling as "*total possible national advantage*" (not saving) is as much a dream as that of the Kaiser for world-wide domination.

Now, on the general question, we have not been told what is the meaning attached to coal conservation. Is it to save the coal being produced, or to have it available for export? We are told there is only sufficient to last for 500 years, and we must be careful with it; and yet, in face of this, we have the coal trades recommending that our export of coal should be increased as much as possible. Are we to make the economies of coal at home for other countries to waste it?

If the output of the mines is to be conserved, what are the colliery owners going to say, or who is going to compensate them for loss of business unless the price is increased sufficiently to cover the losses?

The more one probes the question the more is revealed of the artificialities upon which the report is based.

How is the Government going to reconcile all the reports which have been presented to it? We have the Coal Conservation Report pressing for super-power stations because it is necessary to conserve our supply of coal; we have the Coal Trades Report pressing for a still greater amount of coal to be exported; we have the Electric Power Report pressing for super-power stations, as cheap electricity is the vital point for the future of our industries; and we have the Textile, Iron, &c., Industries Reports pressing for tariff reform and lower railway charges, as these are the essentials to their future welfare. Where are we, indeed?

Veritably this is another instance in which the Government will have to set up a committee to report on the reports which have been presented to it.

The whole case of the super-power stations has been bolstered up with hysterical and exaggerated claims as to saving, together with tempting baits of a universal "given away with half-a-pound of tea style" of cheap electricity.

If the advocates of the scheme had had a really good case they would not have hesitated to state what the cost of setting up the new systems would be, what prices were likely to be charged for the supply, who was going to benefit, and to what certain extent this benefit would reach. Instead of that, we are simply told that a saving of 55 million tons of coal per annum can be expected, and in other directions a total possible national advantage of £100,000,000 per annum.

If on these bare statements we swallow a national electric scheme, then we shall more than ever justify the ridicule that we are a "nation of shopkeepers."

Fredk. W. Purse.
City Electrical Engineer.

Carlisle, *July 16th*, 1918.

The Electrical Propulsion of Ships.

Except in one point the remarks of your correspondent, Mr. William P. Durtnall, in your issue of June 21st, need no comment. He does not apparently defend Mr. Eakil Berg's extravagant claims

for an economic advantage of electric propulsion over mechanical gearing, which it was my object to correct.

Mr. Durtnall is entirely wrong in stating that at the present time it is not economically possible to bring about such a high ratio with gears as is being done with electrical transmission. In one vessel a ratio of 26 to 1 has already been successfully adopted with a single reduction, and by using a double reduction train there is no difficulty or disadvantage in dealing with much higher ratios. The disability that Mr. Durtnall alleges would really appear to lie on the other side, since one system of electric propulsion actually adopts mechanical gearing for a final reduction to the speed of the propeller shaft, doubtless with the object of minimising the weight of the motors.

With the turbine revolutions and the propeller revolutions alike for either system, the simple issue is, as I pointed out, between the losses by transmission in the two systems. The loss with mechanical gearing is about 1 per cent. for a single reduction and about 2 per cent. for a double reduction. Can Mr. Durtnall show anything approaching this efficiency for his system?

Stanley S. Cook.

Wallsend-on-Tyne, *July 17th*, 1918.

Women in Central Stations.

In the early days of the war, volunteering and other causes depleted the trained staffs of electricity generating stations. Much hard work and the introduction of female assistance got us through pretty well, and, after a fashion, we are now carrying on, though the days of record costs, &c., are gone, and "busts" are frequent; the only object left, apart from filling returns to a dozen Government Departments, is to keep the supply going. Now we get from the Home Office, which has been strangely quiet, a lengthy screed promising to upset everything again, because some of us have not made application to an "*inspector* for permission to employ females at night," this being the excuse, while the ostensible motive is the employment of disabled sailors and soldiers who (lumped together) are so "specially suitable to such work"—work, by the way, for which at one time a good general and technical education and three years' training was considered an essential preliminary. Why an untrained soldier, unless he comes from the Engineers, or an untrained sailor, unless he comes from the Torpedo School, should be specially suitable, possibly only a Whitehall clerk, directed by a politician, is capable of discerning; mere professional engineers and managers who have to deal with facts get shocked when such brain waves beat on them, and wonder dully whether even the engineering trades are to go into muddled limbo.

No one objects to give a man who has served his country in the Army or Navy, especially if he has been one of those in uniform who actually fight the enemy or the elements, a chance; and I for one have asked, not once but many times, for such men from my Labour Exchange, but they do not swarm this way. There is another point: Are generating stations to be free training schools with highly-paid alumni, or commercial undertakings?

Some Corporations are apt to be nasty when there are no profits to aid the rates—*i.e.*, the owners of compounded cottage property and their friends in the Councils; and it is desirable, if we are to be free training schools, that station managers should not be held more responsible than road surveyors for their financial results. Finally, are we going to take it lying down?

E. H. H.

Instruments for Central-station Switchboards.

My attention has been called to an article by Mr. G. W. Stubbings and a letter thereon by "A.M.I.E.E.," also the reply thereto by Mr. F. A. Nield, of the Aron Co.; and as I carried out the tests referred to by "A.M.I.E.E.," some explanation seems desirable.

As the latter gentleman has written to me on the subject, I know him to be a supply engineer, and not a manufacturer, and I regret that, having quoted my tests, he prefers to remain anonymous; but that is purely his own concern. I must say I think he is rather too outspoken on the question of "bias"; yet Mr. Nield's reference to a "spiteful and personal attack" seems also to be rather overdone.

I recently had occasion to make a series of comparative tests of the two types under discussion, for which both manufacturers were told what was required, and were asked to submit their latest production.

Hence our tests were made on a type of mercury watt-hour meter that probably has not yet come to the notice of Mr. Stubbings. I do not understand Mr. Nield's reference to the then Aron type being now superseded, as he was to send us any such improvement along; but up to now he has not done so.

I wish to make it quite clear that we made these tests with no "bias," or, indeed, with a bias in favour of the Aron type, for I quite expected it to beat the other.

Both makers did their utmost to meet the stringent conditions we imposed, and the pairs of meters were sent specially for the tests, which were carried out in consultation with their representatives.

Actually the results show a greater divergence than your correspondent states, and they are most easily seen on the accompanying sheet of curves, if you, sirs, are able to reproduce it. The two temperatures represent actual winter and summer conditions in our large power and sub-stations. Need I add that every precaution was taken to ensure accuracy and fairness?

With reference to Mr. Nield's last paragraph, the consistency tests were the main feature of our comparison, but I do not see any objection to mentioning that the latest patterns of the two types at that time (1917) gave the following percentage changes due to the effect of (*a*) volts reduced by 10 per cent.; Aron meter, nil; mercury meter, 0·8 per cent.; (*b*) ambient temperature raised from 68° F. to 108° F.; Aron meter, 6·0 per cent.; mercury meter, nil.

Whether the Aron meter gains on the balance, I leave your readers to decide.

E. Fawssett, M.I.E.E.

Newcastle-on-Tyne, *July 15th*, 1918.

[We have received the curves mentioned by Mr. Fawsett, which fully bear out his statements with regard to the effect of temperature changes on the two types of meter.—EDS. ELEC. REV.]

Tubular Earths for Lightning Conductors.

You published a letter from a correspondent, I think, in the REVIEW of May 10th, who commented on the tests mentioned in my article of May 3rd. The following tests have been sent to me by a departmental electrical engineer, and I think confirm my statement that the resistance of tubular earths decreases, to a certain extent, from the date of installation:—

Earth sunk.	Resistance.
December 3rd, 1917	2·1 ohms.
„ 13th, „	1·78 „
March 26th, 1918	1·73 „
June 17th, „	1·68 „

Killingworth Hedges.

London, S.W., *July 22nd*, 1918.

THE ELECTRICAL POWER ENGINEERS' ASSOCIATION.

A MEETING of electrical engineers was held on July 17th at Newcastle-upon-Tyne to consider the question of joining the Electrical Power Engineers' Association. Mr. A. H. MARSHALL, chairman of the Local Section of the I.E.E., was in the chair, and there was a large attendance.

The CHAIRMAN said the meeting was called to consider matters arising out of the meeting held there on June 3rd, at which delegates were appointed to represent them at a mass meeting to be held in London for the formation of an Association of British Electrical Engineers. It had been arranged to hold similar meetings at the headquarters of each of the local sections of the I.E.E., but at all these places, with the single exception of Newcastle, there was a great deal of hostility shown to the proposals of the I.E.E. As the result the London meeting had to be abandoned. This hostility arose partly because the I.E.E. was supposed to have some ulterior motive in taking the action it had done, and partly because of the existence of other associations, notably the E.P.E.A., who thought they were better able to look after the interests of supply engineers. The President and Council in endeavouring to form an association or union were guided solely by a desire to benefit their members and others engaged in the electrical industry; they wanted an association which would look after the economic interests of the younger men, and promote unity amongst the various associations which existed. That they did not go the right way about it was evident from what had happened. From what he could gather, the committee appointed by the Council to get into touch with the existing bodies and to consider the matter, was misled as to the true position, and it was evident from the results that it was ill-advised in backing the A.B.E.E. As soon as it was found that the general feeling of the country was against setting up a new association, the president of the I.E.E., Mr. Wordingham, after negotiation with the executives of the E.P.E.A., the C.T.A.A. and the A.M.E.E. (Mr. Robinson's party), arranged a conference of delegates and members of the council of the I.E.E. for July 9th, in London, to discuss what further steps should be taken to bring about unity amongst the existing associations, and to decide how the help of the I.E.E. could best be given to set up a strong protective association. Mr. Clothier, the secretary (Mr. J. R. Andrews), and himself, met the delegates who had been appointed at the meeting of June 3rd, and told them what had occurred, and as a result of the discussion it was decided to ask the committee of the Local Section of the I.E.E. to call another mass meeting of electrical engineers for the purpose of rescinding the resolution of June 3rd "that this meeting of electricity supply engineers of Newcastle and the district, promoted by the Newcastle Local Section of the Institution of Electrical Engineers, supports the formation of an association of British electrical engineers, and appoints delegates to represent it at a mass meeting to be held in London under the chairmanship of the president of the Institution of Electrical Engineers." At a committee meeting of the local section held on July 8th, the whole matter was again thoroughly discussed, and the committee passed a resolution agreeing with the amended action of the council in supporting the E.P.E.A. At the London conference on July 9th, it was agreed that a protective association be formed from the existing associations,

adopting, for the present, the title of the E.P.E.A., seeing that it was the only association registered as a trade union; that the qualification for membership of the association should remain as at present, but that after December 31st, 1921, all new members should have passed the I.E.E. Associate Membership examination, or its equivalent. He had stated that, in view of the decisions arrived at, he thought Newcastle would be prepared to support the E.P.E.A. He wished to say, as chairman of the Local Section of the I.E.E., that the action of the Institution had been misrepresented by some, and that the president and council were only aiming at the good of its members, and of those others who should be members, but, unfortunately, were not; they had no other object in view. All they wanted to do was to give the support of the I.E.E. as a body to that organisation which showed itself best adapted to look after the interests of the profession. The body which had the greatest claim on their support at the present time was undoubtedly the E.P.E.A.

Mr. HESLOP, of Barrow, reviewing the origin of the E.P.E.A. and the position at the present time, said that if the position of staff engineers was to be improved it could only be done by co-operative effort. They had divided the country into Southern, Midland and Northern sections, with London, Birmingham and Manchester as headquarters. The scheme of government was this: Branches were formed in different parts of the country, committees were elected, and representative members were sent to the divisional committees, and the divisional committees elected representatives to the national committee. The total possible membership was 4,000 or 5,000, estimating about 400 stations in the country, and averaging the staffs at ten per station. In six months' working they had got from 1,200 to 1,500 members, or about one-third of the total possible. In Lancashire and Cheshire, about 90 per cent. were in the association. Yorkshire, also, was strong, and he hoped that a strong and active branch would be started on Tyneside. They had also formed a branch at Glasgow.

Mr. SIMPSON submitted the rules so far as they had been approved, and published.

Mr. H. W. CLOTHIER thought they should make it their duty to study the reports issued by the Board of Trade and other Government bodies regarding the development of the trade of the country. Owing to bad legislation and to blindness on the part of Great Britain they had allowed their electrical industry to proceed with that ultra caution and slowness that had given advantage to their Continental and American competitors. The last report of the Board of Trade issued after the war was most strong on that subject. To put matters right, they must have very strong and keen co-ordination and co-operation, and they must make the electrical industry attractive to the best brains in the country.

In the course of the discussion, Mr. THOMAS (Manchester) stated that the men in charge of the electrical plant in large works should be included. The question whether a foreman fitter was eligible for membership or not, depended on his training and technical knowledge. These matters would be submitted to the committee and decided upon the merits of the case. Most station men would have passed, or ought to have passed, some standard examination; but they insisted on the men having some technical knowledge. After a certain date a qualifying examination would be instituted, and no one would be admitted unless he had passed it, or some other similar examination. The idea was to make it broader until the Association was firmly grounded, and then stiffen the examinations and tests, and make it essential that the men should have obtained some qualification. They took chief engineers, provided they were not employers. Mr. SIMPSON said there were few individual employers in the electricity industry, except in the case of private plants, and usually such men were not practically responsible for the running of the plant. Where a matter arose concerning a member of his staff, the chief engineer would withdraw for the time being, but if he did not withdraw they could ask him to do so. When the question of salary arose there was no doubt as to whether the chief engineer was an employé or not.

Mr. THOMAS said the entrance fee was 5s. and the subscription one guinea; the benevolent fund contribution was optional.

The rescinding resolution having been carried, the meeting terminated, and a gathering of prospective members of the E.P.E.A. was held, Mr. THOMAS in the chair.

[Further information appears in our "Notes" columns.—EDS. ELEC. REV.]

LEGAL.

RIO TINTO CO., LTD. *v.* A. E. G. ELECTRIC CO., LTD., AND A. E. G. ELECTRIC CO., LTD. *v.* RIO TINTO CO., LTD. (Consolidated).

(*Concluded from page* 56.)

Mr. CONWAY, in summing up the case for the defendants, submitted that the A.E.G. Co. were not liable for the defects which exhibited themselves in the machinery after it had been started up by the Rio Tinto Co. in the absence of any representative of the A.E.G. Co. Had that company, he said, been permitted to make the tests in the ordinary way before the plant was started up the defendants would have been in a position to remedy any small defects which might have shown themselves, and so have prevented the failure of which the plaintiffs complained. After dealing with the question of non-payment by the plaintiff company, counsel proceeded to discuss the matter of costs of the proceedings before the arbitrator. The plaintiffs had set up issues which were not material to the action, and he therefore asked that the costs of the arbitration should go to the defendants. He submitted that the defendants were entitled to the balance of the contract price, at any rate as from August, 1915, when the plaintiffs started the plant themselves, and they were also entitled to interest by way of damages.

Mr. GRANT, K.C., summing up the case for the plaintiffs, said the first point was whether he had established a right to damages—and he submitted that he had—and if so, to what amount. The arbitrator having found that the defendants had supplied a machine which had radical defects in design, the defendants, to escape from liability occasioned by the finding, fell back on something in the nature of confession and avoidance. It was absurd to say that it was a bad finding. The arbitrator was sitting as a jury to decide technical points, and one of the questions submitted to him was whether the machine supplied was defective in design or not, and his answer was that it was defective, the critical speed being too low, viz., that it was below, whereas it ought to have been above, the running speed. If it were to be held that the finding of the arbitrator was *ultra vires* he would have nothing more to say, because his whole case rested upon the finding, and he submitted that his right to damages immediately followed from the finding.

The REFEREE, at the close of Mr. Grant's speech, reserved his judgment, the hearing having occupied fourteen days.

ISAACS *v.* HOBHOUSE.

THIS case came before Mr. Justice Darling and a special jury in the King's Bench Division on Tuesday of last week. It was an action by Mr. Godfrey Isaacs, managing director of the Marconi Wireless Telegraph Co., Ltd., against Sir Charles Hobhouse, M.P., an ex-P.M.G., to recover damages for alleged libel.

The action was the outcome of litigation between the Marconi Co. and the Government for breach of contract, which, during the hearing in court, was settled in favour of the company, but when the case was before the Court, Sir Edward Carson, K.C., counsel for the Marconi Co., made certain statements which Sir Charles Hobhouse described in the House of Commons as untrue.

Mr. Leslie Scott, K.C., Mr. Hawke, K.C., and Mr. Stuart Bevan appeared for the plaintiff; and Mr. D. M. Hogg, K.C., and Mr. Eustace Hills for the defendant.

Mr. SCOTT said that the defence was that the libel was true, the alleged libel being contained in a long statement made by the defendant in the House of Commons, and repeated by him in a letter which he subsequently published upon being challenged by Mr. Isaacs to repeat in public the statement which he made in the House of Commons. In February, 1914, Sir Charles Hobhouse, who was then P.M.G., went to Berlin and inspected the installation of the Telefunken Co. In June, 1914, Mr. Isaacs, being in Paris, met two of the directors of the Telefunken Co., and in the course of that interview they informed him that the defendant had invited their company to compete with the Marconi Co. in England in respect of three of the stations of the wireless chain, the Government having the right to cancel the rights of the Marconi Co. in respect of these. Mr. Isaacs received confirmation from the directors of the German company of what they had told him in Paris. On February 4th, 1915, an interview took place between the plaintiff and the defendant at the latter's house in London, nobody else being present, when defendant admitted that when he went to Berlin he had sought to get the Telefunken Co. to come over to this country and compete with the Marconi Co. At that interview the defendant did not dispute the truth of the statement made in the Telefunken Co.'s letter that he had asked the Telefunken Co. to compete. On February 5th, at the defendant's request, Mr. Isaacs went to the Automobile Club, and there defendant asked him what his intention was, saying, "You have your foot on my neck. Do you intend to crush me?" and adding that it would mean his leaving the Government, he asked the plaintiff whether he was disposed to help him. Mr. Isaacs replied that he did not want to crush anybody, but that he wanted fair treatment for his company. Mr. Isaacs said that his company were unwilling to resume the contract, as they mistrusted the Post Office and the conduct of the defendant as P.M.G., and suggested that the contract on the Government side should be handed over to the Admiralty; and afterwards, when the stations had been constructed, the Admiralty should hand them over to the Post Office. Negotiations, however, went on, but nothing came of them. Subsequently the defendant officially denied that he had invited the Telefunken Co. to compete, and stated that the plaintiff had taken advantage of the absence of witnesses to give a wholly untrue and malicious account of a private interview which he had arranged to get the Government and the Post

Office out of a difficulty. Mr. Scott proceeded to relate the terms of the contract eventually made with the Government, the essence of which was that the company were to be repaid by royalties.

At the conclusion of the opening address of Mr. Leslie Scott, Mr. Isaacs gave evidence, generally bearing out the statement of his learned counsel.

Cross-examined by Sir John Simon, Mr. Isaacs said he believed defendant's memorandum of the first interview he had had with him was fabricated, for it contained a number of things which never took place.

Sir John Simon, in his address to the jury on behalf of the defendant, said he would prove that Mr. Isaacs never mentioned the mysterious German letter from the Telefunken directors at the interview he had with the defendant. That interview took place at the Automobile Club in September, 1914, not February, 1915.

At this stage the Attorney-General (Sir F. E. Smith, K.C.) was interposed as a witness by Sir John Simon, and stated that he had charge of the case for the Crown in the Marconi petition of right, and was responsible for the settlement. Sir Charles Hobhouse did not make any representations nor had he anything to do with the settlement.

Resuming his address, Sir John Simon said it was untrue that the plaintiff went to the defendant's house on February 4th, or had any conversation with the defendant on that day. It was also untrue that he gave Sir Charles the long-winded lecture about the woes of the Marconi Co. from the day of its birth. He submitted that Mr. Isaacs's story was invented to win the Marconi action against the Crown, and if money was the only thing in the world it was worth his while to invent it, for it was very likely it would be worth £2,500,000 to the Marconi Co., and of that Mr. Isaacs would get a substantial percentage.

Sir Charles Hobhouse then gave evidence, stating that this was the first occasion on which any imputation had been made against his honour, public or private. Dealing with his visit to Berlin, he said he spoke no German, and selected as his companion for the visit Sir H. J. Norman. They were attracted to the station of the Telefunken Co. in consequence of a statement that the Telefunken had been able to communicate with Togoland. It was understood that the Marconi Co. had a working arrangement with the Telefunken Co. in order to avoid competition. While he was in Berlin he never requested the Telefunken to come and compete with Marconi, nor did Sir H. J. Norman do so as far as he knew. At the interview which he had with the plaintiff at his house in Rutland Gate, the latter never made any suggestion that he had received the letter from the Telefunken Co. Mr. Isaacs's statement that witness said "You have your foot on my neck. Are you going to crush me?" was an absolute fabrication.

Witness had had nothing to do with the settlement of the Marconi action against the Crown, and far from attempting to avoid going into the witness-box, when he learned that the case had been settled he protested to the Attorney-General that he had not been called as a witness.

Cross-examined by Mr. Leslie Scott, witness stated that it was a mistake when he told the House of Commons that he had had two interviews with Mr. Isaacs after communicating with Lord Reading and with Sir H. J. Norman. In September both the Post Office and the Marconi Co. were each saying that the other had broken the Imperial contract. He therefore saw Mr. Isaacs about the matter at night at his private house. That meeting was inconclusive, and therefore he made no note of it. When he assumed office as P.M.G. he was in favour of competition as against monopoly.

(To be continued.)

London Electric Railway: Compensation Claim.

At the Surveyors' Institution, on Friday, Mr. H. F. Lofts, F.S.I., as Arbitrator, heard a claim against the London Electric Railway Co. for £3,209 16s., as purchase money and compensation in respect of the compulsory acquisition of certain land in the district of The Broadway, Westminster, under Parliamentary powers. The claimants were Mr. Henry Charles Wheeler (the freeholder) and his mother, Mrs. Caroline Jessie Wheeler, who is tenant for life.

Mr. Herbert Jacobs was counsel for the claimants, while Mr. H. W. Liversidge represented the Railway Co.

In opening, Mr. Jacobs explained that Mr. H. C. Wheeler was carrying on a coal and wheelwright's business on the property, and a claim by him in respect of this trade had been agreed at £500. It had been further agreed that the Arbitrator should be asked to add that amount to his award, but to show it separately. Therefore, the only question in issue was the value of the land.

Evidence was given by both sides, and Mr. Lofts announced that he would give his decision in due course.

Stoke-on-Trent Corporation v. Triner.

At the Nisi Prius Court at Staffordshire Assizes last week, this case, in which the defendant was a haulage contractor, was heard by Mr. Justice Lawrence. The Corporation claimed £182 from defendant for damage done to a weigh-bridge and an electrical converter rotor in November, 1916. The resident electrical engineer at Stoke, Mr. Cuthbertson, asked defendant for an estimate for removal of the electrical machine from the works to the railway station for repair. Defendant undertook to remove the machine for £3 10s. On November 10th he brought a tractor with a view to fulfilling the contract, but while getting the tractor into position the wheels sank into a cable trench, and the removal was left until the next day, when it was decided to proceed by the weigh-bridge road. In what followed the platform of the weighing machine was broken in, and the off wheels of the tractor went into the pit, while the converter rotor was damaged. Compensation was now claimed for the actual cost of the repairs, £182. The Corporation said that the defendant was negligent in four ways. It contended that he was negligent in driving over a weigh-bridge which he knew had only a capacity of five tons; that if he did drive over it, and was right in driving over it, he was negligent in driving over it in such a way as to put more weight on the weigh-bridge than he need have done; that if he had to drive over the weigh-bridge at all, he should have protected it by putting timber over it, so as to avoid damage to it; and further, that the defendant had an alternative road by which he would have avoided the weigh-bridge altogether. What the defendant said was that whatever he did was done under the direction or with the knowledge of Mr. Cuthbertson. Defendant held that with regard to putting timber or some other protection on the weigh-bridge, it was the duty of the Corporation to do that.

After Mr. Cuthbertson and the defendant had given evidence, his Lordship gave judgment for the defendant. His Lordship said that he could not say it was negligence to choose the one road rather than the other, seeing that Mr. Cuthbertson agreed that if the two off wheels of the tractor were the only wheels to pass over the weigh-bridge all would be well. On the other hand, he warned him about the existence of the electric cables on the "scrap" way. It seemed to him quite reasonable for the defendant to say, "Well, I am not going to run the risk of damaging those cables." It was impossible for him to proceed by the weigh-bridge way without some part of the tractor going over the weigh-bridge. He could not hold that it was negligence on his part. He did the very best he could.

WAR ITEMS.

Non-Ferrous Metal Industry Act.—A further list of names of companies or individuals to whom licences have been granted under this Act appears in the *London Gazette*, July 19th.

Reconstruction Policy.—According to Mr. Bonar Law, it will not be possible to have a House of Commons discussion on the work of the Ministry of Reconstruction before the recess, but he will try and find a day immediately after.

Commercial Treaties.—Mr. Bonar Law states that the Government intends to have its hands free in regard to commercial treaties containing most-favoured-nation clauses when Peace comes. A general statement on the Government policy regarding the question will be made as soon as possible after the recess.

German Factory Fire.—Reuter reports that great damage was done on July 19th by the partial destruction by fire of an ammunition factory of the General Electricity Co. at Plauen, "presumably by spontaneous combustion of explosives." A great number of lives are reported to have been lost.

Winding Up the German Banks.—Under the Trading with the Enemy Amendment Act, 1916, the Board of Trade has made Orders, dated July 15th, for the winding up of the following German Banks (Mr. H. de Vaux Brougham, Senior Official Receiver in Companies' Liquidation, 33, Carey Street, W.C., is the Controller in all cases):—

Dresdner Bank, formerly at 65, Old Broad Street, and now situate at Austin Friars House, London, E.C.

Kais. Koen. Privilegirte Oesterreichische Laenderbank, 9, Bishopsgate, London, E.C., bankers.

Anglo-Oesterreichische Bank (Anglo-Austrian Bank), 31, Lombard Street, London, E.C.

Deutsche Bank, formerly at 4, George Yard, Lombard Street, and now situated at 9, Bishopsgate, London, E.C.

Direction der Disconto-Gesellschaft, formerly at 53, Cornhill, and now situate at Corbet Court, Gracechurch Street, London, E.C., bankers.

Demobilised Electrical Apprentices.—As a result of the efforts of the Manchester and district members of the Electrical Trades Union, an educational committee has been formed to further the better education of apprentices in the electrical industry. Naturally, a good number of the younger members of the trade have had their period of apprenticeship broken through their joining the Forces, and the idea is to help them, when discharged from the Army, to make up for lost time. The committee which has the matter in hand, is arranging a series of lectures and tours of inspection of works connected with the electrical industry. Classes are to be held, and practical demonstrations given, and it is also intended to form a library of works on electrical subjects to be at the disposal of the younger members.

Munitions Dispute Regarding Skilled Labour.—During the past week, while such splendid achievements have been reported from France, contributing to the securing of Victory for the Allied cause, there has been a menacing situation in some parts of the Labour world at Home. The Ministry of Munitions is faced with an unsatisfied demand in munition factories for skilled men to the extent of between 50,000 and 60,000, for whom war work can immediately be found. The Ministry has found it necessary to place an embargo upon certain firms (about 100), refusing them permission to add to their staffs, as they already have more than their proper share considering the present scarcity of skilled labour. The Ministry desires to share the available labour fairly among munition firms, and to prevent competition among firms in securing such labour. It is understood that some firms have been overcrowded with skilled men, while others doing equally important work have been stopped for want of them. In exercising its legal powers limiting the right of employers in the above connection, the Government is doing what is described as absolutely necessary if a proper supply of munitions to the armies in the field is to be maintained. While men of 40 to 50 are being called to the Colours, young men are being left in the munition factories because they are needed there. The nation will only agree to their being left there if they are prepared to accommodate themselves to the skilled labour needs of the present situation. A stoppage of work was threatened, the dispute beginning at Coventry and other large centres where a large number of workers handed in their notices. In our opinion, the Ministry of Munitions did the correct thing in placing the particulars of the trouble before the public at the end of last week. Such a crisis as we are passing through just now demands from those at home a spirit of self-sacrifice and co-operation, and we believe the nation as a whole would condemn traitorous conduct. The atmosphere became less highly charged early in the week, when the Coventry Joint Engineering Committee, district committees, and workshops representatives met on Monday, and after three hours' deliberations passed the following resolution:—

"That we recommend to the workshops representatives and aggregate meetings that we suspend our notices pending a national conference of the joint engineering allied trades, to which we shall send delegates, in order that all skilled workmen shall cease work on a given date, the said conference to be held as early as possible."

Unfortunately, the good atmosphere did not last over Tuesday, for the strike began at Coventry on that day, some 12,000 skilled men ceasing work. According to the official statement of the Ministry of Munitions, an aggregate meeting of members of the A.S.E. and other unions held at Coventry decided that all A.S.E. men and skilled men at Coventry should remain out until the embargo was removed. At Birmingham the Joint Trades Committee proposed a suspension of the embargo on the employment of additional skilled labour for 14 days, otherwise they would cease work on Wednesday evening. The Ministry replied that they could not consent to a suspension. At Manchester notices were put up in some works stating that the men would cease work on July 30th unless the embargo was withdrawn. Lincoln men gave July 24th as the date for action under similar conditions.

Economic Policy.—In the House of Commons last week, Mr. Bonar Law said that it would not be possible to carry the Imports Bill before the recess. It was intended to deal with it immediately after the adjournment, when the statement on economic policy would be made. He said that the problem was being pursued as seriously as anything could be in war time. The problem was one for after the war, and it would not be rushed. In this connection, interest attaches to the interview of a correspondent of the Associated Press of America with Lord Robert Cecil (*Times*, July 19th) on the economic policy of the Allies. He shows how the coming into the war as our Allies of a number of other nations has a bearing upon the resolutions of the Paris Economic Conference. "It is no longer a question of forming some narrow defensive alliance, but of laying down the economic principles of the association of nations already in existence now, and to membership of which we are committed." President Wilson, in January last, advocated the removal, so far as possible, of all economic barriers, and the establishment of an equality of trade among all the nations consenting to the peace, and associating themselves for its maintenance. He also said that free economic intercourse must inevitably spring out of the other partnership of a real peace. Lord Robert Cecil said that we gave our warmest assent to these declarations, but they did not necessarily mean that the associated nations were to have no protective tariffs and no international competition in trade after the war. As was set forth in the programme of the Inter-Allied Labour Conference, the right of each nation to defend its own economic interest could not be denied in face of world shortage. Our arrangements for mutual assistance could not exclude all competition, "though we are most anxious that co-operation should be the keynote of our commercial relations." Germany, "living under ambitious and intriguing masters," was the one obstacle to this economic association of nations. "Economic independence," said Lord Robert, "and free choice are the last things which Germany will ever allow to the peoples within her reach." While the war lasted we must take as measures of war all the steps required to destroy the economic basis of her military effort. When Peace is restored the place of Germany in the commonwealth of nations will be determined by the test established by President Wilson. "If she abandons her old ways and her restless and aggressive policy, if she ceases to use economic policy as a preparation for future war, we shall not be slow to recognise the change, but . . . . a complete change of mind and purpose in her Government are the necessary preliminaries to her admission to participation in our economic partnership." Lord Robert Cecil concluded by stating that neither the U.S.A. nor the British Empire would pursue any selfish policy, and the pre-occupations of out internal reconstruction would never blind us to the obligations which we owed to our associates. He hoped we should soon meet round the council board to discuss in detail the economic association which would combine the resources of the civilised world in the joint work of reconstruction and the restoration of prosperity.

Exemption Applications.—In asking the Halifax Tribunal for the withdrawal or variation of the exemption granted to M. W. Brophy, aged 33, Grade 2, tramcar driver, whose medical class had been reduced on July 1st from Class A, the National Service Representative said subsequent grading did not take a man out of the clean-cut. It was shown, however, that the man held a protection order, on which he would rely, and the application was refused.

The Halifax Tribunal gave exemption to October 31st, open, conditional on Volunteer drilling, to W. Chapman, electrician, aged 44, Grade 1.

At Castleford, exemption was claimed for W. T. Burrows (32, Class A 2), tramway traffic inspector, and three months was granted, without the Volunteer condition.

At Lewes (Sussex), the Lewes & District Electric Supply Co., Ltd., applied for exemption to R. Woodward (27, Class A), shift engineer. The Tribunal had previously allowed temporary exemption subject to substitution, and this was renewed for three months.

Before the Cornwall Appeal Court, on July 15th, J. J. Light (50, Grade 2), electrical engineer, of Falmouth, was granted a medical re-examination.

The Rotherham Tribunal has allowed three months' exemption to M. Martin (40, Grade A), a repairer on the tramways.

At Chesterton (Cambs.), three months' exemption was awarded to W. C. Giddens (45, Grade 2), electrician, of Stapleford.

At Weymouth, exemption until December 31st was granted to R. A. Clarke (44, Grade 2), wireman with Messrs. Brooking & Co., electrical engineers.

Barnes Tribunal has withdrawn exemption held by A. T. Ellis, electrical engineer, as he possesses a munition card.

Maidstone Tribunal has allowed six months' exemption to H. O. Baker (18, Grade 3), stores clerk and stores keeper in the Corporation tramway department.

At Chelmsford, in the case of E. Hockley (46), electrical engineer, it was reported that he had been enrolled as a war-work volunteer, and the appeal was not proceeded with.

At High Wycombe, S. F. Root (41, Grade 3), electrician at the Marsh Paper Mill Co.'s works, was given a month, he having been promised a protection card.

At Barnsley, Messrs. C. Marsden & Sons appealed for the retention of H. R. Bate (30, Grade 1), electrician, but exemption was refused.

At Ross (Herefordshire), the Electric Light Co. appealed for W. W. Maddy (24, Grade 1), who was stated to have been lent to the Chepstow Electric Light Co. Exemption was refused, and the man was directed to join up forthwith.

Surrey Appeal Court has allowed a National Service appeal against exemption to September 30th held by W. P. Philpot (31, Grade 2), manager of the Dorking Electricity Co., and has reduced the period to one month from July 13th.

At Reigate, on the appeal of Mr. G. Martin, temporary exemption was granted to E. Harvey (46, Grade 2), wireman, and lighting and telephone fitter.

At Tunbridge Wells, an appeal was made by A. E. Hills (Grade 3), electrician, and six months' exemption was conceded.

Aged 46, married, and in Grade 2, an electrician employed at the Sloane Gate Hotel appealed on medical grounds to the Fulham Tribunal. His application was adjourned with a view to his obtaining national service work.

Detempering Steel.—The Swiss journal, *Die Elektroindustrie*, gives particulars of a process for removing the temper from hardened steel. The piece to be softened is placed on a plate of iron at red heat and covered by a plate of cold iron. After the whole has cooled, the piece of steel, whatever was its previous quality and degree of hardness, is detempered completely, and can easily be worked, without its quality having undergone any change by, for example, decarburisation. The method is specially applicable to the unhardening of tools, more particularly punches and dies. Tests have given excellent results, and the method has the advantage that shaped pieces of steel do not show any shrinkage after treatment.

BUSINESS NOTES.

Government Control of Trade.—The London Chamber of Commerce some time ago placed before the Prime Minister its views on the above subject, and the main points of principle on which it desired to have his re-assurance, are as follows :—

(a) That it is not the settled policy of the Government as a whole to stop the business of merchants, brokers and agents, in cases where they perform services which entitle them to reasonable remuneration for such services. (See typical complaint from Iron, Steel and Metal Trades.)

(b) That the tendency of certain Government Departments, notably the Board of Trade, the Ministry of Munitions and the Ministry of Reconstruction, to ignore merchants, brokers and agents individually, or the organisations representing them, is undesirable on the economic ground that all sections of the community should be allowed to serve the national cause.

(c) That the Government recognise that the present control of trade and industry during the war should be relaxed so far as national necessities will allow, and that, where possible, individual enterprise, organised by those concerned in co-operation with Labour, should be reverted to as far as practicable.

(d) That closer co-ordination on questions of principle between Government Departments in regard to the supply and distribution of essential commodities should be provided for in the interests of efficiency.

(e) That the interests of importers, distributors and exporters should be treated on an equal basis with producers, and that individual Chambers of Commerce and other Traders' Associations should be recognised equally with Manufacturers' Associations and Trades Unions in the constitution of all Committees set up for the purpose of advising the Government on questions of trade, commerce and industry.

(f) That no effect shall be given to so-called schemes of "reconstruction" without report to Parliament, and ample opportunity being given to the business community to consider them, and that, broadly speaking, the State should not intervene in matters which the individual singly, or in combination, is able to carry out unaided by the State.

Under date July 1st, 1918, Mr. Lloyd George has intimated to the Chamber that he is "sympathetically disposed" toward all the above points, and that "he is satisfied, after consulting the several Departments, that those points of principle are being taken fully into account." The Chamber now suggests that any trades that consider that the policy of Government Departments is not in accord with its contentions toward which the Prime Minister is "sympathetically disposed," have an opportunity of raising the matter with the Department concerned, either as individuals or through the medium of their Chamber of Commerce or their organised Trade Association.

Sweden.—Among the new electrical engineering concerns recently organised in Sweden is the Aktiebolag Elektroturbins Werkstader, Stockholm, which has been registered with a maximum capital of £7,500.

The American Electric Vehicle Industry. — It is announced that the Walker Vehicle Co., of Chicago, has purchased the parts, jigs, and tools of the General Vehicle Co., whose works at Long Island City have been taken over by the American Government for war work. The manufacture of G.V. electric motor trucks will, it is understood, be discontinued, but service in connection with those already in use will be maintained by the Walker Co.

Electric Wagons for Milk Transport.—We understand that Messrs. Featherstone (London Agents), Ltd., of Westminster, have placed a contract with Messrs. Mossay & Co., Ltd., for six "Orwell" electric motor wagons for milk transport, two of the vehicles being of 3½ tons capacity and four of 2½ tons.

Works Holidays.—THE BRITISH WESTINGHOUSE ELECTRIC AND MANUFACTURING CO., LTD., announce that their works will be closed from 5.30 p.m. to-day (Friday), until 7 a.m. Tuesday, August 6th, to enable them to overhaul and carry out the necessary repairs to their plant. Special arrangements to accept materials during the period mentioned have been made.

MESSRS. L. GARDNER & SONS, LTD., Patricroft, Manchester, are closing their works from to-night, July 26th, until the morning of Tuesday, August 6th.

Manufacturers' Conference.—At a Conference of Manufacturers convened under the auspices of the National Union of Manufacturers (Incorporated), and held at Central Hall, Westminster, S.W., on Tuesday, the following resolution, proposed by Sir Edward Carson, K.C., M.P., was passed :—

"This meeting, consisting of members of British manufacturing firms, desires to represent to H.M. Government that on the declaration of Peace many firms now engaged on war work will be greatly disorganised, and will find it difficult to continue to give employment to their workpeople. They therefore wish to impress on the Government the urgency and importance of putting an end to the present uncertainty, and of at once making a declaration of our national economic policy as it affects our Empire, our Allies, Neutral and Belligerent Countries. This meeting further desires to express its opinion that it is essential that the Government should so frame its policy that the reconstruction of industries should not be hindered or threatened by undue foreign competition or dumping, and that the resources of the whole Empire and of our Allies may be made available for rehabilitating their commercial position."

Book Notices.—*Dynamo and Motor Attendants and their Machines.* By F. Broadbent, M.I.E.E. Ninth Edition. London : S. Rentell & Co., Ltd. Price 3s. 6d. net. Pp. xv. + 212 ; figs. 107.—This well-known and popular handbook has been out of print for some time, and its reappearance on the market will be welcomed. Owing to the conditions of the times, only minor alterations have been made ; the book has been reset, and a page of errata and addenda which is inserted should not be overlooked. As may be stly inferred from its popularity, the book is a most useful guide to the man who has to live with electrical machinery ; essentially practical, it aims to provide him with just that class of information which will be most immediately useful to him in his daily work, but, at the same time, it is a truly technical work, giving the reasons for its recommendations. The section dealing with A.C. motors should be particularly useful, as there is a great demand for information on this class of apparatus.

"Scope and Application of the National Electrical Safety Code." (Circular of the Bureau of Standards). Washington : Government Printing Office. Price 20 cents.

"Manual of Radio-Telegraphy and Telephony for the Use of Naval Electricians." By Capt. S. S. Robison, U.S. Navy. Fourth Revised Edition. Pp. 256 ; 117 figs. London : S. Rentell & Co. Price 8s. 6d. net.

"Names of Streets and Places in the London Postal Area, showing the Initials of the Postal District and the Number of the Office of Delivery." London : H.M. Stationery Office. Price 4d. net.

"Annales des Postes, Télégraphes et Téléphones." June, 1918. Paris : A. Dumas. Price 14 fr.

The *Anglo-Italian Review* for July contains an article by Mr. E. Strachan Morgan on "Electric Developments in Italy."

"*Proceedings* of the American Institute of Electrical Engineers." Vol. XXXVII, No. 6. June, 1918. New York : The Institute. Price $1.

Trade Announcement.—THE BRITISH UTILITIES, LTD., have removed from South Park Road to a larger factory at Wandle Bank, Wimbledon.

Moonlight.—Already MESSRS. C. A. VANDERVELL AND CO., LTD., have sent us the moonlight chart for August, which is compiled by their chief engineer, Mr. A. H. Midgley, and admirably illustrates the lunar changes during the month.

For Sale.—Ipswich Corporation has for sale a continuous-current multipolar dynamo ; Bradford Corporation invites tenders for a vertical Corliss steam engine and 1,000-KW. Westinghouse D.C. generator. See our advertisement pages to-day.

A Canadian Labour Dispute.—The directors and workmen of the Canadian General Electric Co., of Peterboro, the largest industrial company in Ontario, have agreed to the appointment of a Conciliation Committee, and a strike has been averted.—*Times.*

LIGHTING AND POWER NOTES.

Argentina.—STRIKE.—Owing to the general strike the German Electric Supply Co. has only a few days' supply of fuel on hand, and is trying to buy large quantities of maize for use as fuel.

Australia.—SYDNEY.—BULK SUPPLY.—The following conditions are proposed with reference to the bulk supply to the Sydney Municipal Council by the Railway Commissioners : Castlereagh Street Sub-station.—The Council to pay 3d. per unit, with an additional £1 10s. per KW. of the maximum demand each year, to bear the cost of energy lost in conversion and transmission, to pay rent for the use of the H.T. mains at the rate of £250 per annum for the first two years, beyond which period the rent is to be fixed by agreement, and to pay the cost of the switchgear used in the sub-station. Lang Park Sub-station.—The Council to pay ·35d. per unit, to bear the cost of energy lost in conversion and transmission, to pay £1 10s. per KW. of the maximum demand, to pay for the switchgear required at the sub-station, and to connect the tramway city sub-station and the Lang Park sub-station, at an estimated cost of £324.

The Council has instructed the city electrical engineer to draw up a specification, as a basis for the purchase by the Council of a developed or undeveloped colliery.

EAST PERTH.—The new power station, which has been erected by the W.A. Government, although not yet working quite up to a third of its capacity, is supplying electricity over a radius which includes the Blackboy Hill Military Camp, 12 miles north of Perth, and the Naval Base, 14 miles south. It is also supplying energy for the city electric tramways, and a portion of the lighting for the City Council. It is intended, at a later stage, entirely to replace the City Council electricity works, and to supply the whole of the requirements of the city from the Government station.—*Aus. Industrial and Mining Standard.*

Barnsley.—MAINS EXTENSIONS.—Subject to the consent of the Ministry of Munitions and the L.G.B., the T.C. has decided to lay a new cable to the works of Messrs. Wood Bros., at an approximate cost of £4,000.

Barnstaple.—WAGES.—A Consultative Committee has recommended the T.C. to appoint an assistant engineer, at a salary of £180 per annum, rising to £200, to engage a switchboard attendant, and to grant an all-round increase to the men at the electricity works of 7s. 6d. per week.

Bingley.—YEAR'S WORKING.—The annual accounts of the T.C. electricity department for the year ended March 31st last show a revenue of £3,051, whilst the expenditure amounted to £2,772—including £1,088 paid to Keighley Corporation for supply in bulk for three-quarters of the year, the last quarter's account not having been yet received. Interest and redemption fund absorbed £799, leaving a net loss of £522.

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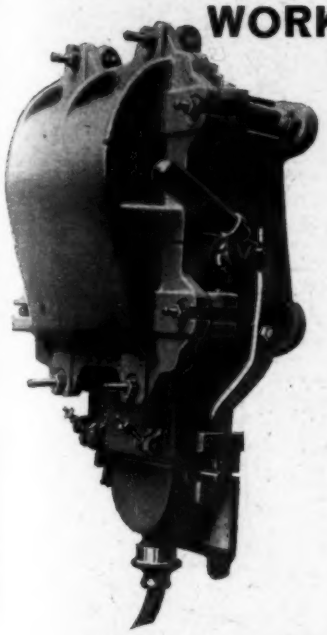

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Plug Contacts are in separate Chamber.

The Plug cannot be inserted the wrong way or withdrawn while current is on.

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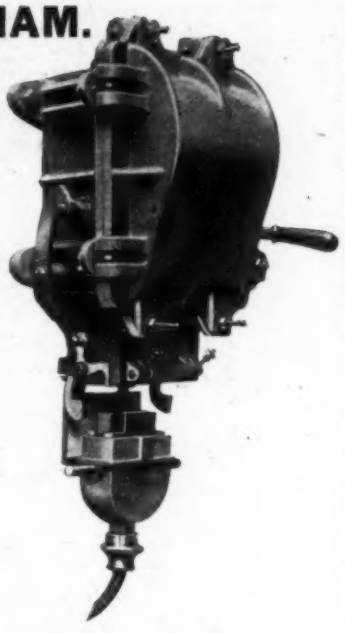

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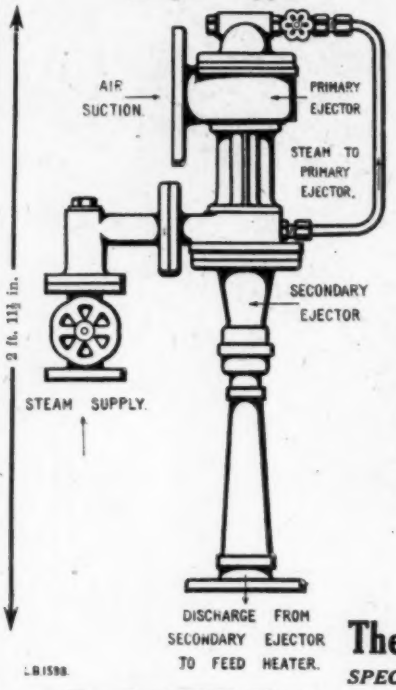

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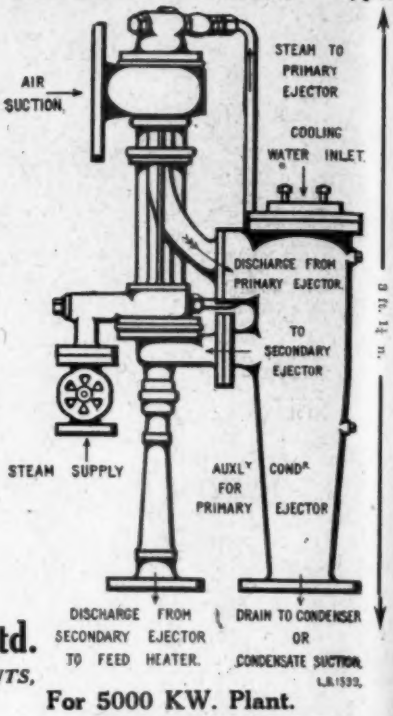

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With loose or removable keys, 1/4 per way ex.

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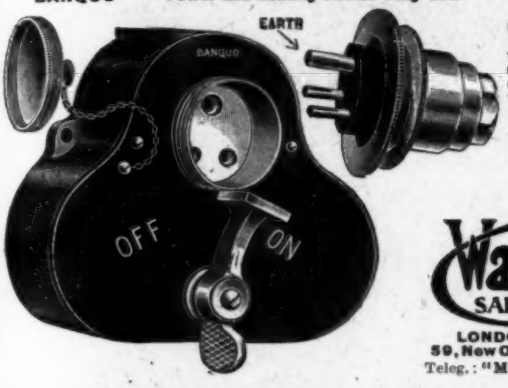

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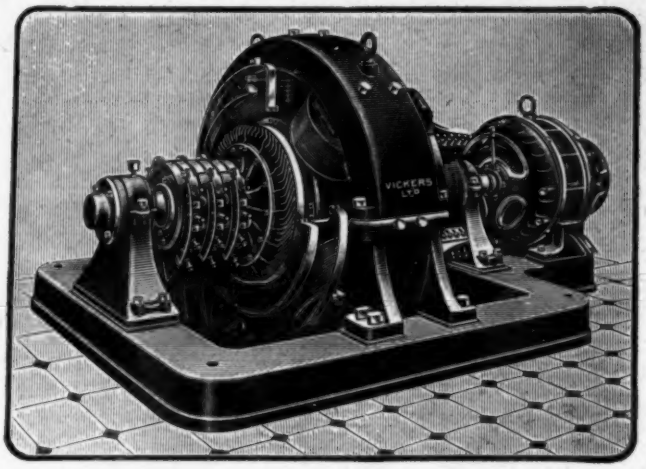

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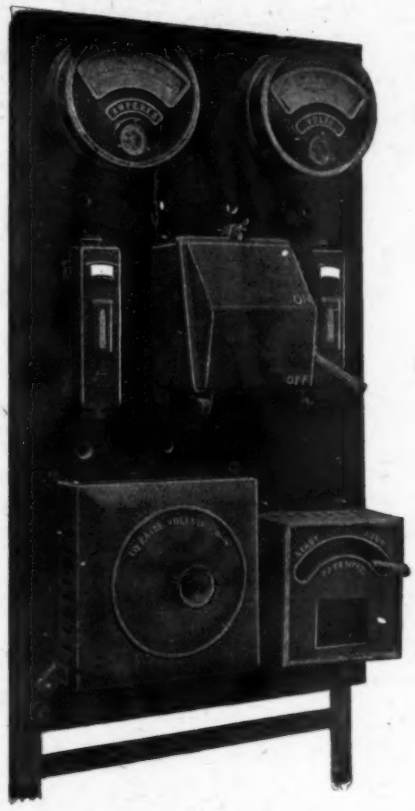

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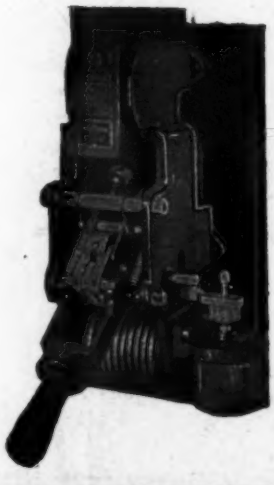

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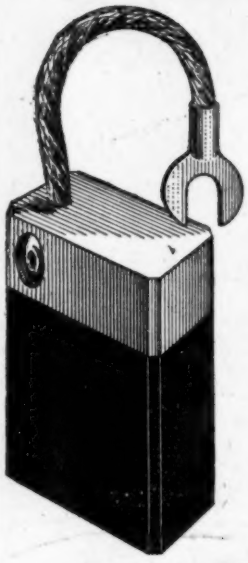

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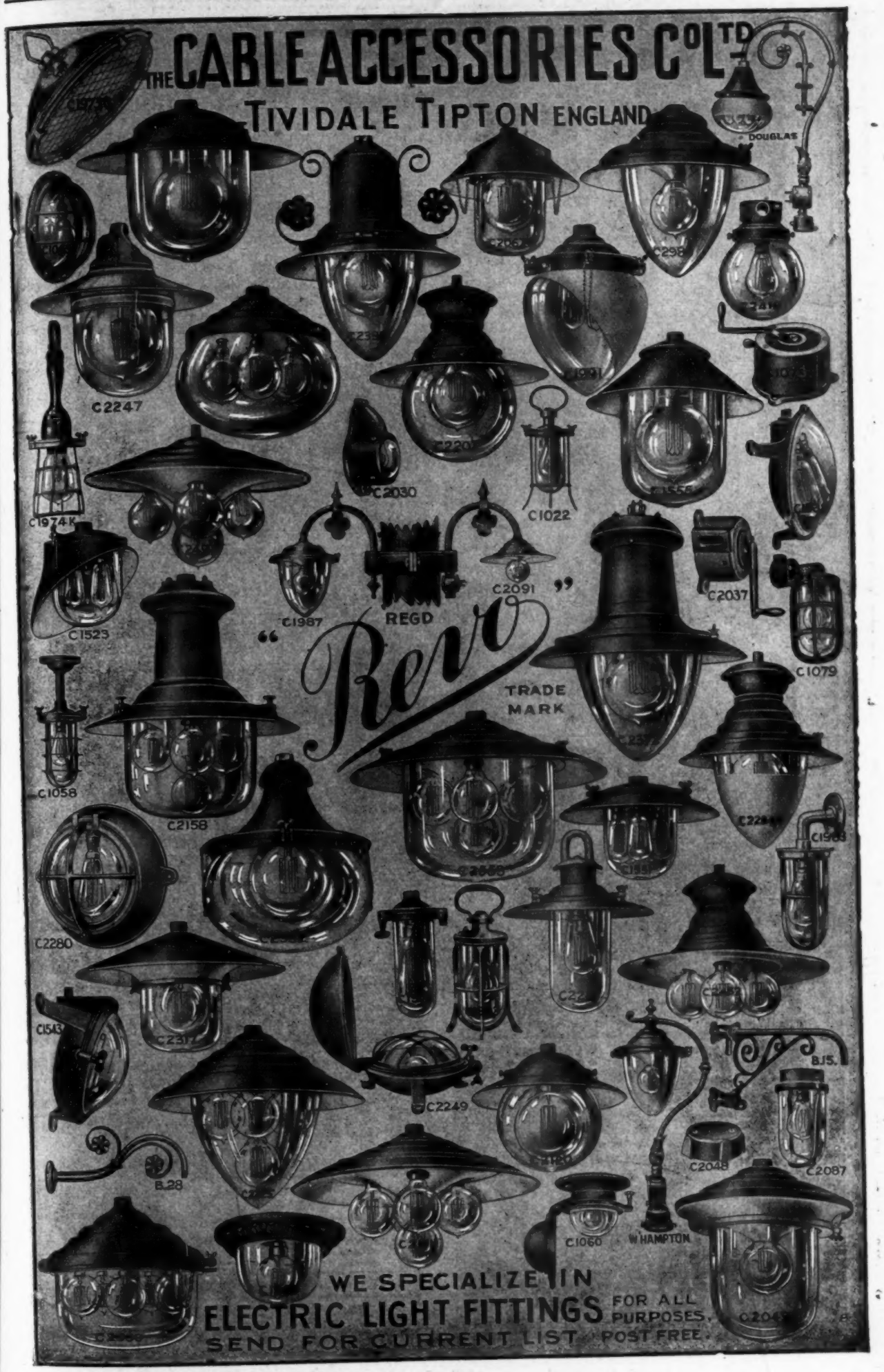
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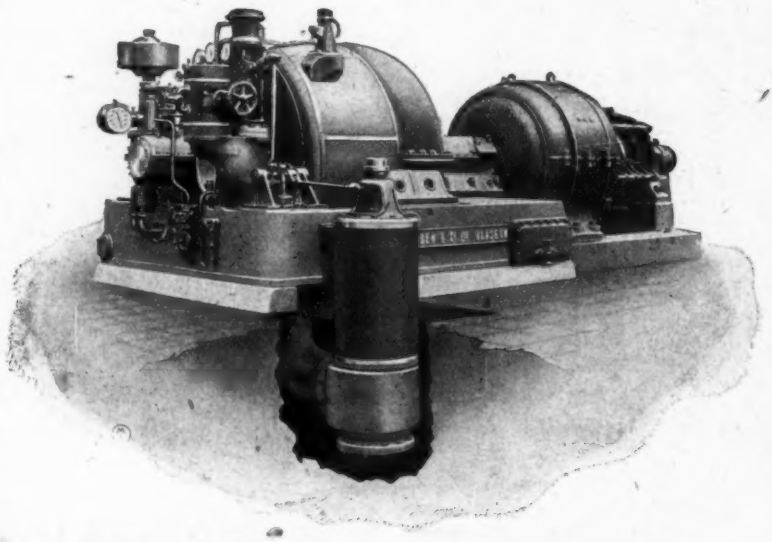

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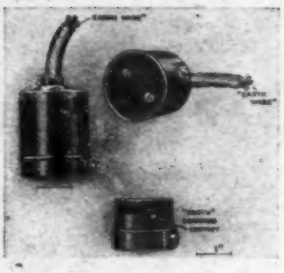

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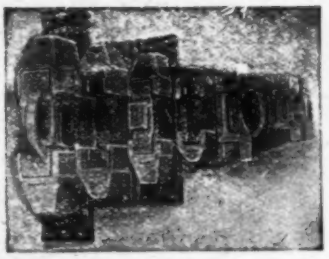

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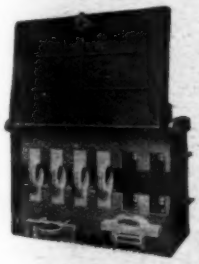
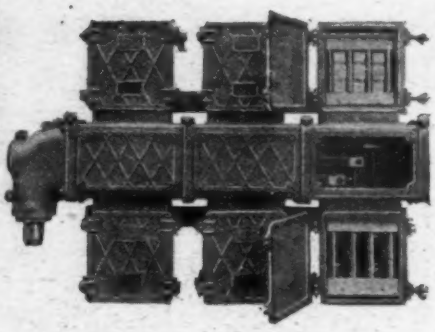
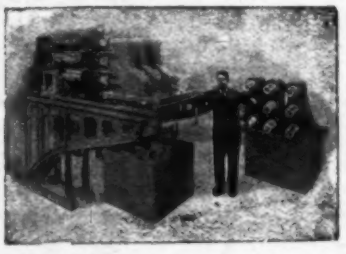




(5) **MINING SWITCHGEAR.** ⟶
Draw-out Pillar Type.

(6) **H.T. and E.H.T.** **A.C. SWITCHGEAR, &c.,**
ARMOURED THROUGHOUT for all Sizes of ELECTRICITY SUPPLY SYSTEMS.

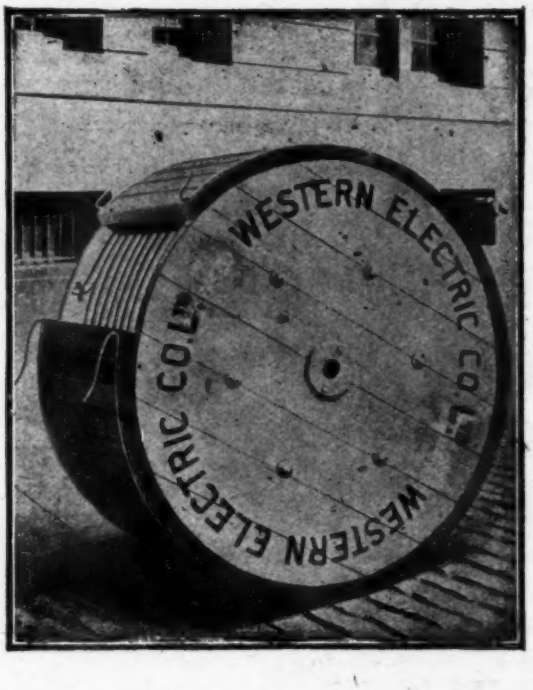


A. REYROLLE & CO., LTD.,

HEBBURN-ON-TYNE.

Western-Electric

On Every Highway and By-way



these drums of

WESTERN ELECTRIC CABLE

bear silent witness to the universal satisfaction resulting from its use.

Best for overhead lines and indispensable for underground construction.

Western Electric Company Limited

Branch Offices and Stores:

BIRMINGHAM, GLASGOW, LEEDS,

SYDNEY, JOHANNESBURG, BUENOS AIRES.

Agents for India: Jost's Engineering Co., Ltd., Bombay.

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VALUERS

and AUCTIONEERS of

Electrical Works, Plant and Stock.

WHEATLEY KIRK, PRICE & CO.

(Established 1850).

46, Watling Street, London, E.C. — **16, Albert Square, Manchester.**

26, Collingwood Street, Newcastle-on-Tyne.

MESSRS.

PERCY HUDDLESTON & CO.

HAVE RECEIVED INSTRUCTIONS

TO SELL BY PUBLIC AUCTION

AT THEIR

SALE ROOMS, RAILWAY ARCHES, DALLING ROAD, HAMMERSMITH, W.,

On THURSDAY, AUGUST 1st, 1918,

AT 12 O'CLOCK PRECISELY,

A Large Quantity of ELECTRICAL APPARATUS,

COMPRISING:—

10 Motors, 100 to 500 volts; Five Emery Grinding Machines; Electric Drill; 4000 feet of Conduit; Fans; Cable, Wire and Flexible Cord; Main and Branch Switches; Wall Plugs; 80 dozen Key-Switch, Batten and other Lampholders; Pattrasses; Ceiling Roses and Cut-Outs; Bells; Indicators; Brass, Copper and Oxydised Fittings, including Pendants; Electroliers; Ceiling Fittings; Hall Lamps; Brackets; Radiators; Green and E.I. Shades; Half-watt Lanterns; Drilling Machines; Shafting; Pulleys; 2500 feet of Belting; Pump; Fly Press; Tinman's Tools; Smith's Bellows; Mortising Machines; Tanks; Wire Rope; Safe; Typewriters; Roll Top Desk; Oak Chairs and numerous Other Effects.

On View the Day Previous and the Morning of Sale. *Catalogues can be had post free* on application from PERCY HUDDLESTON & Co., Electrical and Mechanical Auctioneers and Valuers, 72, Finsbury Pavement, London, E.C. 2, and 16, Albany Road Bedford. Telegrams: "Sultanship Ave. London." Telephones: 585 London Wall; 662, Hammersmith. 2152

SITUATIONS VACANT.

Latest time for receiving 9.30 a.m. Thursday.

If letters are not to be delivered to certain firms or individuals (if known), instructions to that effect should be sent to the Manager of the ELECTRICAL REVIEW, who will do his best to carry out such instructions. Letters of applicants cannot in such cases be returned to them, nor can the names of Advertisers using a number in any way be disclosed.

Original Testimonials should never be sent.

EBBW VALE URBAN DISTRICT COUNCIL.

THE DISTRICT COUNCIL invite applications for the appointment of a Resident Electrical Engineer. Salary £250, rising by annual increments of £10 to £300 per annum.

Candidates for the position should have had experience of the erection and maintenance of a large overhead distribution system, be conversant with the management of a Municipal Electricity Undertaking with over 1,000 consumers, and shall also have had experience in the management of an Installation Department. The District Council have no generating station, but purchase current in bulk.

The successful applicant will be required to devote his whole time to his duties, and not engage in other work.

Applications (stating age, qualification and experience), accompanied by copies of three recent testimonials, should be enclosed in a sealed envelope, endorsed on the outside "ENGINEER," and should be delivered at my office, not later than the 12th AUGUST, 1918.

THOS. HUGHES,
Clerk.

Dated the 19th day of July, 1918. 2138

SITUATIONS VACANT.—*Continued.*

COUNTY BOROUGH OF OLDHAM.

THE OLDHAM CORPORATION ELECTRICITY COMMITTEE invite applications for the position of Shift Engineer, in charge of an 8-hour shift. Weekly wage £2 10s., and war wage £1 8s. 9d.

Applicants must have had a good mechanical and electrical training, and must also have had previous experience in an electric generating station giving L.T. direct and E.H.T. supplies.

Applications, endorsed "Shift Engineer," stating age, experience, &c., together with copies of not more than three recent testimonials, to be sent to MR. FRED. L. OGDEN, Borough Electrical Engineer, Greenhill Electricity Offices, Oldham, not later than THURSDAY, the 1st AUGUST, 1918.

Canvassing will be a disqualification.

J. H. HALLSWORTH,
Town Clerk.

Oldham, 22*nd July*, 1918. 2164

ELECTRICIANS.

ELECTRICIANS (age 21 to 45) wanted for service as Electrical Artificers in the Royal Marine Submarine Miners.

Preference given to men who have had Generating Station experience, and also to those with a practical knowledge of paraffin engines.

This rating carries rank of Corporal, with pay at rate of 2s. 6d. per day and 1s. 8d. per day Engineering pay, and the usual separation allowances.

Candidates should apply by letter, stating experience and enclosing copies of Trade references, to:—

DEPARTMENT OF NAVAL RECRUITING,
20, Cranbourn Street,
Leicester Square,
London, W.C. 2. 2168

SHIFT ENGINEER.

THE RAWTENSTALL CORPORATION invite applications for the position of Shift Engineer. Applicants should have had experience in Lancashire and Water-Tube Boilers, Steam Turbines, and High-Tension Three-phase System. Applications giving full particulars, stating wages required together with copies of not more than two testimonials, to be sent in to the undersigned not later than WEDNESDAY, the 31st instant.

C. L. E. STEWART, A.M.I.E.E.,
Borough Electrical and Tramways Engineer.

Bacup Road, Rawtenstall,
July 23rd, 1918. 2169

ADMIRALTY.

Department of Electrical Engineering.

ELECTRICAL DRAUGHTSMEN required, with experience either in machine and control gear design or general ship electrical installations.

Apply giving details of experience, stating age, salary required, and whether at liberty to accept Admiralty appointment, and forwarding copies of recent testimonials, to DIRECTOR OF ELECTRICAL ENGINEERING, Admiralty, Great George Street, London, S.W. 2180

RADCLIFFE URBAN DISTRICT COUNCIL.

Shift Engineer.

SHIFT ENGINEER wanted, with previous experience in direct current three-wire and traction supplies, high-speed direct-coupled steam sets. Experience with rotary converter equipments will be a recommendation. Wages £3 5s. plus 12½% per week of 56 hours. Certified Undertaking.

Applications, giving experience, age, to be sent to ENGINEER AND MANAGER, Electricity Works, Lomax Street, Radcliffe, Lancashire. 2193

ENGINEER IN CHARGE.

WANTED, Engineer in Charge of the station of the Ascot District Gas and Electricity Company. Should be experienced with Diesel and gas engines, and with the usual work of a D.C. 3-wire supply station. Commencing salary, inclusive of all bonuses, £220 per annum.

Applications, with copies of three recent testimonials, to be made to A. E. BROOKS, Engineer and Manager, Gas and Electricity Works, Ascot. 2197

CHARGE ENGINEERS.

CHARGE ENGINEERS wanted for Midland power station, experienced with Turbines, Water-Tube Boilers and E.H.T. three-phase. Salary £3 9s. per week, including all bonuses.

Apply, stating experience, age, and enclose copies of testimonials, to 2192, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

(Continued on next page.)

SITUATIONS VACANT.—*Continued.*

ASSISTANT MAINS ENGINEER FOR CALCUTTA.

WANTED for Calcutta, an Assistant Mains Engineer with practical experience in laying, jointing and maintenance of extra-high-tension, 3-core, paper-insulated cables, and of low-tension V.B. rubber or paper-insulated cables. Special consideration will be given to men experienced in laying cables on solid system. Applicants should not be eligible for military service.

Apply stating age, nationality, salary required, and enclosing copies of testimonials, to SECRETARY, Calcutta Electric Supply Corporation, Limited, 2, Broad Street Place, E.C. 2. 2154

FITTER.

EXPERIENCED FITTER required for Electricity Generating Station accustomed to repairs and maintenance of high-speed engines, B. & W. boilers, chain-grate stokers. Good wages will be paid and a permanency guaranteed to a suitable man.

Also Engine Driver used to high-speed engines. Wages 57s. 6d. for 56 hours.

Apply stating age, experience and wages required, to ELECTRICAL ENGINEER, Electricity Works, Llandudno. 2160

WELSH METROPOLITAN WAR HOSPITAL, WHITCHURCH, nr. CARDIFF.

REQUIRED, Assistant Electrical Engineer, accustomed to power station work, with an intimate knowledge of steam boilers, engines, dynamos, accumulators, telephones, &c. Applicants to be ineligible for military service, or in a low medical category.

For further particulars apply to the OFFICER-IN-CHARGE, stating present salary earned. 2162

SWITCHBOARD ATTENDANT.

SWITCHBOARD ATTENDANT required for 3-wire D.C. station (certified undertaking). Experience with batteries essential.

Apply stating age, full particulars of experience and wages required, to—

BOROUGH ELECTRICAL ENGINEER,
Electricity Works,
Barnstaple, N. Devon. 2097

DERBY CORPORATION ELECTRICITY DEPARTMENT.

WANTED, Switchboard Attendant, wages 60s. per week plus 12½ % 48-hour week.—Applications endorsed "Switchboard Attendant," stating full details, should be addressed to—

BOROUGH ELECTRICAL ENGINEER,
9, Irongate,
Derby. 2085

ASSISTANT ENGINEER.

WANTED in Metropolitan Power Station, Assistant Engineer; usual shift duties in extra high tension, 3-phase station in certified undertaking. Previous 3-phase experience essential. Wages £2 18s. per week of 48 hours, usual overtime, and 12½ per cent. bonus on earnings.

2178, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

CHARGE ENGINEER.

CERTIFIED Undertaking has vacancy for Charge Engineer in Power Station. Must have had technical training and experience with steam and E.H.T. three-phase plant. Wages 70s. per week inclusive. Apply with details of experience and copies of recent testimonials. 2182

Cheap prepaid Advertisements are inserted under this heading at the rate of One Penny Per Word (minimum 1s.). Three Consecutive Insertions for the price of two, if ordered and prepaid with first insertion.
Box Number and ELECTRICAL REVIEW address count as seven words.

ARMATURE Winders, used to repair shop, D.C. work. No person resident more than 10 miles away, or already on Government work, will be engaged.—Apply H. D. & S., 32, Newington Causeway, S.E. 1686

ASSISTANT Female Storekeeper, used to electrical accessories. No person already on Government work will be engaged.—Apply, with particulars of experience, to your nearest EMPLOYMENT EXCHANGE, mentioning No. A5763. 2172

BOURNEMOUTH. Man wanted to take charge of Generating Plant in general departmental store. Must be accustomed to gas engines, and with knowledge of electric wiring preferred. Permanent, progressive position, discharged man (navy) preferred. —Apply MANAGING DIRECTOR, Bright's, Ltd., Bournemouth. 5171

CHARGE Engineer (Junior) wanted, D.C. and A.C. Certified Undertaking, to take light shifts and train for heavy. Pay £3 weekly, including all bonuses to date.—Apply with full particulars, age, training and experience, to 2194, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SITUATIONS VACANT.—*Continued.*

CHARGE Engineer wanted for certified power station, Midlands A.C. and D.C. supply trams, destructor, batteries, boosters. Applicants must have had mechanical and electrical training; pay to commence 60s. weekly, including all bonuses to date.—Apply, with full details of age, experience, if married, present position and pay, when at liberty, to 2026, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

CHARGE Engineer wanted for combined A.C. and D.C. station in Scotland.—Apply stating age, experience and wage required, to 2166, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

COMMERCIAL Assistant required. Some Electrical knowledge desirable. Discharged soldier preferred. No person resident more than 10 miles away, or already on Government work, will be engaged.—Apply, stating age, experience, and salary required, to 2189, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

COMPETENT Electricians required for lighting, motors, telephone work. No person resident more than 10 miles away, or already employed on Government work, will be engaged.—Apply W. T. CLARKE & Co., LTD., Electrical Engineers, Silver Street, W.C. 1. 2183

DESIGNING Engineer for electrical machines wanted by large firm in Midlands. Must be thoroughly experienced mechanical man with good shop experience. No person already on Government work will be engaged.—Apply, stating experience, age, and salary required, to your nearest EMPLOYMENT EXCHANGE, mentioning this paper and No. A5684. 2069

DRAUGHTSMAN, experienced in Ship Electrical Installation work, required. State experience, age and salary. No person already on Government work will be engaged.—Apply to your nearest EMPLOYMENT EXCHANGE, mentioning this paper and No. 2033.

DRAUGHTSMAN wanted for Jig and Tool work, also Draughtsman for Switchgear work (Tyneside). No person already on Government work will be engaged.—Apply stating age and salary expected to your nearest EMPLOYMENT EXCHANGE, mentioning this paper and No. 2021.

DRAUGHTSMEN. Applications invited from first-class men experienced in any of the following classes of work:—(a) H.T. and L.T. switchgear; (b) Detail mechanism; (c) Motor control gear. Permanent and progressive employment. Manchester district. No one already on Government work need apply.—Apply to your nearest EMPLOYMENT EXCHANGE, mentioning No. A5652, and stating age, experience and salary required. 2030

DRAUGHTSMEN. Good mechanical men wanted by electrical engineering firm in Lancashire, for control gear, contactor and liquid type. Experience in this particular class of work not essential. Permanency to suitable men. No one already engaged on Government work will be employed.—Apply stating age, experience and salary required, to your nearest EMPLOYMENT EXCHANGE, mentioning N. A5649. 2031

ELECTRIC Lamps.—Man wanted with practical knowledge of exhausting and capable of doing repairs. No one already on Government work, or residing more than 10 miles away, will be engaged.—RENEW LAMP Co., 847, Harrow Road, N.W. 10. 5133

ELECTRIC Plant Attendant wanted for lift duty, in West End of London. Must be thoroughly acquainted with high speed engine driving, dynamos, and switchboard operation. Wages 63s. per week of 56 hours. Ineligible for army. No person resident more than 10 miles away, or already on Government work, will be engaged.—2140, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Draughtsman wanted, one with experience in controllers, resistances and switchgear. No person already on Government work will be engaged.—Apply by letter stating age, experience and wage required, to your nearest EMPLOYMENT EXCHANGE, mentioning this paper and No. 2136.

ELECTRICAL Engineer. Designing Engineer wanted by large electrical firm in Lancashire, used to the design of control gear. One with knowledge of contactor gear preferred. No one already on Government work will be engaged.—Apply to your nearest EMPLOYMENT EXCHANGE, mentioning No. A5653, and stating age, experience and salary required. 2029

ELECTRICAL Fitter wanted for Generating Works. Preference given to man who has had previous experience on high-tension work. Inclusive wage 66s. 4d. for 53-hour week.—2132, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Fitter wanted with Tramway Motor experience. —Write or call MANAGER, 590, Lea Bridge Road, Leyton, E. 10. 1777

ELECTRICAL Foreman wanted shortly for Clyde shipbuilding yard. Must have had experience of large contracts for Admiralty and Mercantile ship installation; a strict disciplinarian, good organiser and energetic man essential. No one already on Government work need apply.—Give full particulars, experience, age, and salary expected, to your nearest EMPLOYMENT EXCHANGE, mentioning No. A5700. 5082

(Continued on next page.)

SITUATIONS VACANT.—*Continued.*

ELECTRICIAN required to take charge of, and run small plant consisting of water-power turbines and auxiliary oil engine. To carry out installations and repairs.—Apply, stating age and wages required, to SECRETARY, Dulverton Electric Lighting Co., Ltd., Dulverton, Somerset. 5182

ENGINEER and Manager wanted for small D.C. supply station, seaside. Must have experience of Diesel engines, and be of low category. State full particulars and salary required.—1974, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ENGINEER required for Country Mansion, situate 35 miles London; plant consists Hornsby gas engine, gas producer plant, dynamos, electrically-driven pumps, accumulators, some 200 lighting points, telephones and bells; house and wood fuel provided. —2173, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ENGINEER, with experience of both A.C. and D.C. plant, wanted to take charge of shift in certified electricity works, South of England. Commencing wage 40s. plus 20s. plus 12½ per cent.—2171, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

EXPERIENCED Foreman or Forewoman required to take charge of flashing and mounting department, carbon filaments. No person resident more than 10 miles away, or already on Government work, will be engaged.—9728, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

GENERAL Manager required by well-established electrical contractors in Midlands, chiefly engaged at present on war work; must be experienced in estimating power, light, telephone contracts, also handling men.—Full particulars, age, experience, and salary required, to WM. IRONS, Solicitor, St. James Street, Sheffield. 5196

HOTEL Electrician-Engineer required for first-class hotel on sea-front. Duties include full charge of electrical plant, hotel heating and steam apparatus. Stoker employed. Sleep and board out. Should have had previous experience in hotels, or upkeep of private plant, gas engines, battery, telephones, &c.—Apply, giving copies of testimonials, state age, salary expected, to MANAGER, South-Eastern Hotel, Deal. 2141

LEAD Burner wanted, used to small portable battery work. Preference given to man having some experience of repair work. Permanency for suitable applicant. No person resident more than 10 miles away, or already on Government work, will be engaged.—5072, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

MAN wanted to assist Chief of Progress Staff, and to take control of about ten chasers. Must have had previous experience in the same work in engineering establishment. Good prospects for energetic and capable man. No person already on Government work will be engaged.—Apply by letter stating age, experience and salary required to your nearest EMPLOYMENT EXCHANGE, mentioning this paper and No. 2153.

MANN, Egerton & Co., Ltd., have vacancies in their London and Eastern Counties' Branches for thoroughly experienced (*a*) Electrical Contracting Engineers, (*b*) capable and efficient general office Staff Organisers, with electrical knowledge. No person resident more than 10 miles away, or already on Government work, will be engaged.—Apply in writing, giving full particulars, to S., 379, Euston Road, N.W. 1. 2151

PLUMBER-Jointer wanted with good experience of high and low-tension lead-covered cables and cable maintenance generally. Wage 9½d. per hour for 50-hour week, with £1 and 12½% bonus.—Apply, stating particulars of experience, and when work could be commenced, to the GENERAL MANAGER, Electricity Department, Dunning Street, Sunderland. 2082

SHIFT Engineer required by Llanelly & District Electric Light and Traction Co., certified undertaking. One not at present engaged in munition works, and not of military age, unless exempted or discharged; 8-hour shift.—Write, stating experience, with testimonials and salary required, to 15, Cowell Street, Llanelly. 2142

SHIFT Engineer required for large sub-station, in steel works taking three-phase E.H.T. supply from outside, and supplying L.T. direct and alternating current for works' use, by means of rotary converters and static transformers respectively; duties consist of seven 8-hour shifts per week. Candidates for post must have held similiar positions, and are required to state at the time of application, details of their training and experience, age, salary required, and earliest date upon which they could commence their duties after appointment. Persons already employed on Government work will not be engaged.—Apply your nearest EMPLOYMENT EXCHANGE, mentioning No. A5702. 2087

STORES Assistant required; woman or discharged soldier preferred. No person resident more than 10 miles away, or already on Government work, will be engaged.—Apply MR. COOK, Klaxon, Co., 38, Blandford Street, W. 1. 2144

SUPERINTENDENT required for 6000-KW. power station in Scotland. Must have first-class mechanical and boiler-house experience, and, preferably, with 3-phase E.H.T. experience. Good salary to thoroughly reliable man.—Apply, giving salary expected, age, married or single and date on which duties could be commenced, 2056, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SITUATIONS VACANT.—*Continued.*

SWITCHBOARD Attendants wanted for Station in North Midlands with 3-wire D.C. lighting, traction and E.H.T. 3-phase, with rotaries running direct and inverted. State age, experience and salary required.—2063, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

TECHNICAL Assistant wanted with knowledge of Switchgear and experience in commercial correspondence and handling of Specifications. No person already on Government work will be engaged.—Apply by letter to your nearest EMPLOYMENT EXCHANGE, mentioning this paper and No. 2028.

TEST Room Assistant, accustomed to electricity meters; capable of doing small repairs; woman or discharged soldier preferred: permanent job for suitable applicant. No person resident more than 10 miles away, or already on Government work, will be engaged.—Apply MR. COOK, Klaxon Co., 38, Blandford Street, W. 1. 2143

WANTED, a qualified Mechanic for the maintenance of gas works plant. To be experienced with electrical plant.—Apply GAS WORKS, Warrington. 2131

WANTED an Armature Winder; must be ineligible for military service; good wages to suitable man.—Reply, giving full particulars of training, experience and age, to 2084, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Armature Winders used to winding small armatures, and good Fitters used to fitting up small motors; S.E. district. No one employed on Government work, or residing more than 10 miles away, need apply.—Apply 129/133, Lambeth Road, London, S.E. 1. 2149

WANTED at once for London station, Shift Engineer; wages to commence £3 15s. to £4 per week, according to ability.—2190, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, by a firm in the S.E. district engaged on munition work, first-class Telegraph Mechanics. No person resident more than 10 miles away, or already engaged on Government work, will be engaged.—State age and experience to 6125, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, by leading engineering insurance company, Electrical Surveyors, having good knowledge of the theory and practice of alternating and direct-current plant.—Applicants must be ineligible for the Army or Navy.—2181, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Charge Engineer for certified undertaking; must have had mechanical and electrical E.H.T. experience; wages £3 10s., plus 12½% war bonus per week of seven 8-hour shifts.—Apply, stating age, and full details of experience and training, to GENERAL MANAGER, Tramways, Atherton, Lancs. 2186

WANTED, Electrical Engineer with a knowledge of D.C. machine design. Nobody engaged on Government work need apply.—Apply, giving particulars of age, experience, and salary required, to SIEMENS BROTHERS DYNAMO WORKS, LTD., Stafford. 2083

WANTED, Electricians used to power work. No person resident more than 10 miles away, or already on Government work, will be engaged.—MACDONALD, SYER & CO., LTD., 295, Gray's Inn Road, W.C. 2073

WANTED, for country house, Electrician Handy-man, ineligible for military service, to run electric light plant, accumulators, telephones, bells, capable of doing small repairs, and general handy jobs.—Apply stating age, experience, references and wages required, to MISS WHITEHEAD, Wilmington Manor, near Dartford, Kent. 5151

WANTED, General Assistant to Works Manager in an old-established electric lamp factory. Good opening and progressive salary. No person already on Government work will be engaged.—Apply your nearest EMPLOYMENT EXCHANGE, mentioning No. A5667. 2037

WANTED, man (ineligible) to take charge of electric lighting and pumping plant on estate in Berkshire.—Apply stating experience, wages, references, &c., to 5154, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Mechanical Fitter for small electric steam power station on Government Work.—Apply, stating previous experience and wages required, to ELECTRICITY WORKS, Stamford. 2129

WANTED on a Scottish Power Company (Certified Undertaking), a Shift Engineer with good mechanical and electrical training. Good wages to a man thoroughly experienced in E.H.T. 3-phase work and boiler house control.—Reply giving full particulars, with copies of references, to 1975, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Shift Engineer for Power Station, A.C., three-phase, E.H.T. and D.C. supply. Wages £3 10s. per week and overtime.—Apply, giving full particulars of past experience and testimonials, to the MANAGER, Sheerness and District Electric Power and Traction Co., Ltd. 2052

(Continued on next page.)

SITUATIONS VACANT.—*Continued.*

WANTED, Working Foreman, experienced in alternating, single, three-phase and 500-volt tramway current, also thoroughly experienced in maintenance work, electric lighting and power motors. Permanent situation to qualified and capable man. Apply with references. No person already on Government work will be engaged.—Apply your nearest EMPLOYMENT EXCHANGE, mentioning No. A5767. 5178

WANTED, Working Manager for small Electrical Public Supply Company in Oxfordshire. Must be practical and trained, having experience with producer plant and D.C., and able to execute running repairs. Salary £150.—Apply stating age, experience and when at liberty, with two recent testimonials, 2196, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WINDERS wanted for medium size Induction Motors; district rate and output bonus. No person already on Government work will be engaged.—Apply by letter to your nearest EMPLOYMENT EXCHANGE, mentioning this paper and No. 2133.

WIREMEN wanted, permanency. Good wages. Electricity Undertaking in the Midlands.—Reply stating age, rate and experience, to 2049, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SITUATIONS WANTED.

Cheap prepaid Advertisements are inserted under this heading at the rate of One Penny Per Word (minimum 1s.). Three Consecutive Insertions for the price of two, if ordered and prepaid with first insertion.
Box Number and ELECTRICAL REVIEW address count as seven words.

ADVERTISER, 18 years' experience testing laboratories, power stations and works, requires change, meters, instruments, motors and dynamos, cables and batteries.—5104, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ASSISTANT Commercial Manager, 14 years' general supply station and contracting experience, desires post progressive firm. Ineligible, energetic, highest refs.—5179, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ASSISTANT Engineer desires an appointment; over 12 years' experience in the generation and distribution of electrical energy.—5175, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

CAPABLE Electrician desires situation as Manager or Foreman on controlled work, 22 years' experience lighting, heating, 'phones, &c.; last 8 years complete control as manager of West-End contractors; age 36.—5140, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

CHARGE Engineer desires change; good mechanical and electrical experience; Grade 2.—5117, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

CHARGE Engineer desires change, works plant, all-round experience, low category.—5195, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

CHIEF Draughtsman, shortly disengaged; over 20 years' extensive workshop and electrical instrument experience and jig and tool design.—5037, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

DRAUGHTSMAN (Junior).—Youth, 16½ years, just left technical school, requires situation with Electrical Engineers.—YOUNG, 153, Taybridge Road, Battersea, S.W. 11. 5099

ELECTRICAL and Mechanical Engineer, A.M.I.E.E., A.M.I.M.E., age 42 years; workshop training, 20 years' central station plant mains, tramways experience in responsible positions, 10 years in present post, desires change, first-class references; salary about £350 for permanent post.—5085, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Engineer Designer (29) desires change. Good technical education; five years' works experience; six years commercial and design, D.C. and A.C. machinery. Government work in Yorkshire, West Riding, preferred.—5143. ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Engineer, full of energy and enterprise, shortly disengaged; used to control of men, capable organiser with initiative, keen buyer, good estimator, and well up in theory and practice, present sales engineer to supply company; work of national importance essential, 20 years' experience, excellent references.—5121, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Engineer (34), ineligible, desires permanent responsible post; thoroughly experienced central station, mains and installation management; salary round £250.—5193, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Fitter (28) Grade 3, desires change, health reasons, Cornwall and West Country preferred; experienced in all inside and outside central-station and factory routine.—5093, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICIAN, age 43, Grade 3, requires situation with electrical firm; 25 years' experience; well up in figures and estimating.—5160, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SITUATIONS WANTED.—*Continued.*

ELECTRICIAN and Assistant seeks berth; lighting or power.—5168, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICIAN desires berth national importance; thoroughly experienced dynamos, motors, accumulators, lighting and steam engines. Age 35.—BROWN, 601, Romford Road, Forest Gate, E. 7. 5181

ELECTRICIAN desires position running plant, able to control men if necessary. Discharged R.N.—Reply to A. J. H., 8, Wells Street, Camberwell, S.E. 5. 5174

ELECTRICIAN, good all-round; Foreman, charge, or otherwise. Government work only; near London preferred.—"VOLTS," 78, Chesilton Road, Fulham Road. 5157

ELECTRICIAN or Shift Engineer, seeks berth, A.C. and D.C., erection of installations, plant, or station work.—5080, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICIAN-Jointer (26), D.C., paper, jute, lead, armoured, 3 and 4-cored and concentric cables, feeders, motors, lighting, 'phones, bells, conduit, casing, 11 years' experience, desires permanency; discharged.—HILLIER, Paul Street, Frome, Somerset. 5192

ENGINEER, working, 14 years' experience, seeks charge of plant-controlled works, doing all own repairs. Erecting, &c., both electrical and mechanical. Excellent testimonials. London or suburbs.—5109, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ESTATE Electrician seeks charge of large estate or institution plant.—5045, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

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WIREMAN wants job, ineligible; country preferred.—5176, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WORKS Electrician, sound practical experience with A.C. and D.C. plant, installing, maintenance and repair.—W. SWINDEN, 41, Rothschild Road, Chiswick Park. 5172

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Cheap prepaid Advertisements are inserted under this heading at the rate of One Penny Per Word (minimum 1s.).
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AN important London firm of merchants with special electrical department wishes to represent in Italy, France, Switzerland, and Spain, firms manufacturing electrical porcelain insulators and fittings, also electrical lamps and/or other articles for electrical industry.—Write, giving full particulars, stating terms, to 5091, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

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FOR SALE.

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6½ miles	1/18	at	£10 10s. per mile.
¼ "	3/22	"	£13 10s. "
8 "	3/20	"	£17 0s. "
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Free Delivery, London Districts. Terms, Cash on Delivery.

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(Continued on next page.)

FOR SALE.—*Continued.*

MACHINERY FOR SALE.

BOILERS.

BABCOCK & Wilcox Water-tube Boiler, 140 lbs. W.P., 250 H.P.
Two Marine Type Boilers, 14′ 10″ × 6′ 7½″, 120 lbs. W.P.
One Marine Type Boiler, 10′ 3″ × 9′ 3″, 120 lbs. W.P.
Yarrow Water-tube Boiler, 11′ 3″ × 9′ 6″ × 3′ 6″ drum, 180 lbs. W.P.

GAS ENGINES.

Magnificent 500-H.P. Hor. Gas Engine, with Alternator, by Nuremberg.
110-H.P. Crossley ZE Gas Engine and Suction Plant.
80-H.P. Stockport Gas Engine.
45-H.P. Crossley Gas Engine.
Two 33-H.P. Premier Gas Engines.

ELECTRIC MOTORS OR GENERATORS.

350-KW. G.E.C. Alternator, 230 volts, three-phase, 50 periods.
300-KW. Westinghouse Alternator, 2400 volts.
Belt or Rope-driven Generator, 250 KW., 500 volts, 120 R.P.M., by B.T.H.
Belt or Rope-driven Generator, 230 volts, D.C., 100 H.P., 800 R.P.M.
Two 12-H.P., 220-volt, series wound Motors.
Six 25-H.P., 460-volt, Traction Motors, reversing and variable speed.

JOHN F. WAKE, Engineer, Darlington. 2157

MACHINERY FOR SALE.

ONE 80-H.P., 400/500-volt, three-phase, slip-ring 50-period Motor, 1450 R.P.M., fitted with brush-lifting and short-circuiting device. Oil-immersed rotary starter and switch case, comprising 3-pole switch, no-volt and overload release, and ammeter.
Two 30-H.P., 480/530-volt, D.C., shunt-interpole Motors, 900 R.P.M. complete.
One 20-H.P., 220-volt, D.C. shunt, totally-enclosed Motor, 900 R.P.M. complete.
One 20-H.P., 200-volt, D.C. compound, interpole Motor, 800 R.P.M. complete.
Two 130-H.P., 200-volt, shunt, 3-pedestal bearing Motors, 300 R.P.M., with special switch pillars.
One 9-KW., 125-volt, compound Dynamo, 900 R.P.M.
Two 8-H.P., 200-volt, shunt interpole Motors, 1400 R.P.M. complete.
Two Cinema Motor Generator Sets.

THE VICTORIA ELECTRIC PLANT CO.,
Spenser Street, Westminster, S.W. 1.
'Phone: Victoria 4026. 'Grams: Vicminster, Sowest, London. 2179

MACHINERY FOR SALE.

5-FT. Radial Arm Drilling Machine, by Whitworth; 2¼″ spindle; slotted bed-plate. Ditto, 4′ 6″ arm, tapping motion, boxed table.
Treble-geared Facing and Boring Lathe, by Buckton; 84″ face-plate; strong tool.
Cold Iron Saw, by Isaac Hill; ditto, by Becker, for two saws.
50-H.P. Stockport Gas Engine; 20-H.P. Crossley; 16-H.P. Tangye.
Vertical 3-throw Geared Pumps, 7¼″ rams, engine driven. Set 6¼″ ditto, motor driven, 550 volts.
115-KW. Generating Set, 220 volts.
C.I. Tank, 25′ × 17′ × 4′ 6″; 12,000 gals.
600-H.P. Horizontal Compound Tandem Condensing Steam Engine, rope fly-wheel 18′ dia.
Large stock of other machinery.
Further particulars and prices—
J. T. WILLIAMS & SONS,
37, Queen Victoria Street,
London.
Telephone: City 3938. Works: Hop 834. 1998

MOTORS, SWITCHES AND FUSES AND STARTING GEAR.

A.C., 2 and 3-phase, 200 v., 400 v., 50 periods, 5, 7, 10, 15, 25, 27, 30, 35 H.P.
D.C., 220 v., 440 v., 1, 2, 5, 10, 15, 20, 25, 30 H.P.
Power Cables, Distribution Fuseboards and Switches.
Safety Automatic Devices for either A.C. or D.C. circuits.
Concrete, sound materials and workmanship.
Guaranteed 18 months.
"ROBUST MACHINERY," 62, Bradford Street, Walsall. 2040

MACHINERY FOR SALE.

ONE Generating Set Comprising:—
"Howden" Enclosed Compound Engine for 150 lbs. steam pressure, direct-coupled to compound interpole generator, having an output of 300 KW. at 240 volts, 375 r.p.m.; built in 1910, and in first-class order.
Specification and print on request.

THE PHŒNIX ELECTRICAL CO.,
32—36, Broomielaw, Glasgow. 1943

FOR SALE.—*Continued.*

MACHINERY FOR SALE.

50-KW. Steam Generating Set, by Scott & Mountain, direct coupled to Generator, 500 volts, 100 amps., 500 revs.
25-KW. Steam Generating Set, two crank Comp. Engines, direct coupled to two-pole Dynamo, 100 volts, 250 amps., 450 revs.
6·5-KW. Steam Generating Set, by Robey & Co., direct coupled to two-pole Dynamo, 130 volts, 50 amps., 350 revs.
Two 50-KW. Willans & Robinson Central Valve Engines, direct coupled to Dynamos, 115 volts, 435 amps., 470 R.P.M.
Compound wound Bi-polar Dynamo, by Scott & Mountain, 220 volts, 450 amps., 550 revs.
Motor-Driven Face Milling Machine, by Hetherington and Co., facing head 18″ diam.
Gwynne's 7″ Centrifugal Pump, direct coupled to Motor, 460 volts, 40 amps., 1070 revs.
No. 3 Four-spindle "Acme" Automatic Screw Machine for ⅝″ bars.
3½″ Centres "Lo-Swing" Lathe on 8′ bed.
3″ by 36″ Jones & Lamson, all-geared head Flat Capstan Lathe.

CATALOGUE of Stock MACHINERY. 2-3000 LOTS.
Free on Application. Inspection invited.
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Tel.: "Forward, Sheffield." SHEFFIELD.

R. H. LONGBOTHAM & CO., LTD., WAKEFIELD,
and at Milburn House, Newcastle-on-Tyne.
Tel: { 44 Wakefield. / 867 Newcastle. Telegrams: "Engineer, Wakefield."

FOR SALE.

ONE Parsons Steam Turbo Set, 3500 KW., 1200 R.P.M., with alternator field-rotating type and exciter complete; 6000-volt maximum load, 40 cycles.
One ditto, 1500 KW., 2-phase, 2000 volts, 50 periods.
One Willans-Parsons Steam Turbo Set, 1200 KW., with Alternator, 1200 R.P.M., 200 lbs. to sq. in., 11,000 volts, three-phase, complete with exciter, also condensing plant, air, and circulating water pumps, &c.
One Parsons Turbo-Alternator, 300 KW., two-phase, 2000 volts, 50 periods.
One Surface Condenser, 3,400 sq. ft., Cooling Surface, by Cole, Marchent & Morley, complete with pumps, &c. 5277

GAS ENGINES AND ALTERNATOR.

FOR Sale, 10-B.H.P. Andrews Stockport Gas Engine, two fly-wheels and pulley, tube ignition.
89-B.H.P. Crossley Gas Engine, X.A.E. type, with extra heavy fly-wheel, electric lighting engine, magneto ignition.
142-B.H.P. Crossley Gas Engine, Z.A.E. type, with extra heavy fly-wheel, electric lighting engine, magneto ignition.
One 70-KW. Elwell-Parker single-phase Alternator, wound for 110 or 220 volts, with separate exciter.
Can be seen running.
CRYSELCO LIMITED, Kempston Works, Bedford. 2107

WATER-TUBE BOILER.

GOOD Bargain to anyone wanting Babcock & Wilcox Water-tube Boiler, land type; capacity, 4500 to 5000 lbs. steam per hour; working pressure, 150 lbs.; heating surface, 1350 sq. feet. Good insurance report. Immediate removal. Reason for disposal, no further use.—W. VERNON & SONS, 4, Lloyd's Avenue, London, E.C. 3. 2177

WATER-TUBE BOILERS.

FOR Sale, two Babcock & Wilcox Water-tube Boilers, 12,000 lbs. capacity, complete with superheaters, chain grate stokers, &c. —Full particulars on application to the
BOROUGH ELECTRICAL ENGINEER,
9, Iron Gate, Derby. 2167

ELECTRIC MOTORS.

SALE or Hire. Second-hand Machines in Stock. ARMATURES and Coils repaired at shortest notice.
THE TITAN ELECTRICAL CO.,
9/11, Eagle Street, W.C.
'Phone: Central 13,191.

(*Continued on next page.*)

FOR SALE.—*Continued.*

CITY OF BRADFORD.

Electricity Department.

THE BRADFORD CORPORATION invite Tenders for the following Plant, of which they are prepared to dispose either for re-erection or for breaking-up purposes :—

One Cole, Marchent & Morley Cross-Compound VERTICAL CORLISS STEAM ENGINE and engine-type Westinghouse C.C. GENERATOR : complete with Air Pumps, Grease Extractor, and Exhaust Pipes. Capacity : 1,000 KW. at 85 R.P.M. with steam at 160/180 lb. pressure. Generator shunt and compound wound, 460/550 volts.

The plant has been maintained in a highly-efficient state, and may be seen under working conditions at the Valley Road Electricity Works, Bradford, on application to the City Electrical Engineer and Manager, Town Hall, Bradford, from whom Forms of Tender and further particulars should be obtained before Tenders are submitted.

Sealed Tenders, on the forms provided, endorsed "Tender for Surplus Plant," to be addressed to the Chairman of the Electricity Committee, Town Hall, Bradford, and to be dispatched in time to be delivered not later than 10 a.m. on WEDNESDAY, AUGUST 7th, 1918.

The highest or any Tender will not necessarily be accepted.

FREDERICK STEVENS,
Town Clerk.

Town Hall, Bradford, *July 23rd*, 1918. 2174

MACHINERY FOR SALE.

GENERATING SETS, D.C.

One 500-KW. Willans-E.C.C., 420/500 volts.
Three 256-KW. Belliss-Siemens, 460/500 volts.
One 220-KW. Willans-A.E.G., 220 volts.
One 200-KW. Allen-Parker, 460/500 volts.
One 180-KW. Anderson-Mavor 220/230-volt Set.
One 160-KW. Belliss-G.E.C., 460/500 volts.

TURBO-GENERATORS, A.C. AND D.C.

One 1,000-KW. A.E.G. 500 volts, 50 cycles, 3-phase, with condensing plant complete ; the whole equal to new.
One 500-KW. Parsons, 460/530 volts, with condensing plant complete.

Apply, FRANK GILMAN,
Lightwoods Hill, Birmingham. 2128

MACHINERY FOR SALE.

GENERATING SETS.

TWO Siemens 6-pole Generators, 410 V., D.C., 550 amps., 360 revs., with two Triple-expansion Engines, 360 H.P., 360 revs. Will sell separately.

MOTORS AND GENERATORS.

54 KW., Hall's, 440 V., D.C., 470 revs.
75 KW., E.C.C., 110 V., D.C., 550 revs.
20 H.P., Brooks, 110 V., D.C., 880 revs.
15 H.P., Westinghouse, 500 V., D.C., 650 revs.
20 H.P., Brooks, 220 V., D.C., direct coupled to 4" vertical pump, 100 ft. head.
600 H.P., S.R., 2000 V., 2-phase, 50 periods, 470 revs.
31 H.P., S.C., 500 V., 3-phase, 50 periods, 1440 revs.
11 H.P., S.R., 400 V., 3-phase, 50 periods, 960 revs.

BURY ELECTRICAL PLANT CO., LTD.,
Phœnix Street, Bury.
'Grams : "Electric, Bury." 'Phone : 676 Bury. 2185

D.C. MOTORS.

D.C. MOTORS for Sale, 8, 14, 22, 40-B.H.P., 440 volts, slow speed. Certificate required.

2047, ELECTRICAL REVIEW,
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FOR Sale, 50-line Central Battery Telephone Switchboard, complete with instruments, in first-class condition. Delivery from stock. Suitable for aircraft factory or other large establishment. Complete installation undertaken.

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MACHINES always available for Sale or hire. ARMATURES and FIELD COILS rewound or repaired without delay.

'Phone: 5773 Holborn. MACDONALD, SYER & CO., LTD., 295, Gray's Inn Road, W.C. 1. 8485

FOR SALE.—*Continued.*

FOR SALE.

DYNAMOS, 100 v., 220 a., 900 revs. (Mather & Platt), compound, with spare armature.
110 v., 50 a., 1,100 revs. (Scott), shunt.
500 v., 120 a., 500 revs. (Crompton), 6-pole, interpole single bearing.
230 v., 65 a., 650 revs. (Brush), 4-pole, compound, single bearing.
Motor-generator, 230 v. to 65 v., 40 a. (Newton).
Porthole fan, 24-in., 230 v., 800 revs.
Three Siemens Mining Switches, double automatic, 300 a., 3-pole.
"Robey" Vertical Steam Engine, 10 and 14 × 9 inch.
"Gardner," 1½ H.P., Horizontal Oil Engine, with base to take belt-driven dynamo.
Motors, all sizes, A.C. and D.C.
Switchboards, Cable from 61/12s., Resistances, Carbon Lamps (60 and 65 v., 32 C.P.), Shades, Meters, &c. Send enquiries.

MERCIER, 25, Union Street, Liverpool. 2067

DYNAMO.

CONTINUOUS current multi-polar Dynamo for Sale. Suited for direct-coupling to engine, speed 350, output 200-KW., 460/520 volts as shunt, or 225-KW., 500/550 volts as compound ; 25% overload for one hour. Complete with half-coupling, outer-bearing and shunt regulator. Supplied by The Electrical Co. In first-class condition, modern type.

Price £500 delivered Ipswich.

CORPORATION ELECTRIC SUPPLY DEPARTMENT,
Ipswich. 2134

TURBO-GENERATOR.

1,000-KW. TURBO-GENERATOR, 500 volts, 50 periods, 3-phase, complete with Switchboard, Cables, Surface Condensing Plant, Piping, and Electrically-Driven Centrifugal Pump, together with a quantity of Spare Parts, the whole practically new and ready for immediate despatch at Liverpool.

Apply—

FRANK GILMAN,
Lightwoods Hill, Birmingham. 2170

ORIGINALLY MADE FOR RUSSIA.

THREE Protected Type Squirrel Cage Induction Motors, 14-pole machines, 3-phase, 50 periods, 220 volts, develop 30 H.P. at 410 R.P.M., continuous rating, suitable for direct coupling. Further particulars on application to JAMES KEITH & BLACKMAN CO., LTD., 27, Farringdon Avenue, E.C. 4. 2150

FOR SALE.

FOR Sale, 5000 China Adaptors, 6s. 6d. per dozen ; 2000 half opal 2·5 bulbs, 40s. per 100 ; 500 12" enamelled iron shades, first-class quality, 26s. 6d. per dozen.

2146, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

PRIVATE PLANT.

FOR Sale, Private Plant, comprising dynamo (Newton), volts 50/70, amps. 20, speed 950, 27 E.P.S. accumulators, slate switch-panel complete with switches, ammeter, voltmeter, fuses and resistances. Offers to—

H. P. STOKES,
Tramways Offices, Broadway, Bexley Heath. 2137

PARAFFIN WAX.

UP to Two Tons Paraffin Wax,
124/6, 11d. ; 135/40, 1s. 1d. ;
120/2, 10½d. ; 118/20, 10¼d. Scale, 9¼.

NEWMAN & McKAY,
56, City Road, London, E.C. 1. 5167

JAPANESE TORCH CASES.

10,000 2-cell Baby, with American switch and bulb, 11s. 6d. per doz. ; 5,000 3-cell ditto, 15s. 6d. per doz. ; 5,000 2-cell Large ditto, 14s. per doz. ; 1,000 3-cell ditto, 16s. 9d. per doz. The above are in stock in London for immediate delivery for spot cash.

2175, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

MOTOR FOR SALE.

300-B.H.P., 500-volt, 3-phase, 50-period, 585 R.P.M. Motor, complete, for sale. Immediate delivery.

2191, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

(Continued on next page.)

FOR SALE.—*Continued.*

CUNNINGHAM, LIMITED.

SMALL Motors and up to 300 H.P. rewound and repaired.

Estimates free. 'Phone: "5173 Padd." 171, Edgware Road, London, W. 2.

Cheap prepaid Advertisements relating to second-hand goods and specified Articles are inserted under this heading at the rate of One Penny Per Word (minimum 1s.).

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CAMERON Boiler Feed Pump, duplex 5" stroke × 3" rams gun metal, 125 lbs. boiler pressure. Duplex Hydraulic Pump, single acting, 1¾" rams, 9" stroke, 125 lbs. boiler pressure. Water pressure 800 to 1000 lbs. per square inch.—"ROBUST MACHINERY," 62, Bradford Street, Walsall. 2130

D.C. Motors, 230 v., ¼, ½, ¾, 1, 1½, 2, 3, 4, 5, 7, 10, 20 H.P. Motors, 460 v., 1, 2, 2½, 3½, 4, 5, 6, 8, 10, 15, 20, 30 H.P. Motors, 110 v., ¼, ½, 1, 2, 3, 4, 5, 7, 8, 9, 10, 20, 25, 70, 100 H.P.—5185, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

D.C. Starters to 150-H.P., in all types; Shunt Regulators, all sizes; Voltmeters, Ammeters, Ohmmeter and Generator; 500-v. Testing Set; ½-H.P., 200-v., 100 ~. single-phase Motor, £8 10s.—5187, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

DYNAMOS, 200/250 v., 21, 45, 60, 82, 98, 180, 400, 650 amps. Dynamos, 110 v., 12, 20, 26, 40, 50, 60, 70, 90, 100, 125, 300, 520 amps.; several 60/80 v., 60/80 amps.—5183, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

DYNAMOS, 3000, 1500, 1000 and 750 amperes at 6 volts; also smaller sizes. Apply for lists.—CANNING & Co., Electro-Platers Engineers, Birmingham. 7769

ELECTRIC Motors and Dynamos, Sale or Hire. Always a large stock of nearly new guaranteed machines. Immediate delivery.—ELECTRO-GENERATOR Co., 1A, Shepherd's Bush Road, W. 'Phone: 488 Hammersmith. 4723

ELECTRIC Motors for sale, A.C. and D.C.; good numbers in stock; immediate delivery.—SUGDEN, Wakering Road, Barking. 4915

ELECTRIC Vehicles. Four three-wheel Vans, motor fitted in the front wheel, all with solid rubber tyres, one fitted with batteries. Cheap for quick sale.—HYAMS, 11, Glengall Terrace, Old Kent Road, S.E. 5156

FOR Sale, about 1 ton Mica Flake and 5 cwt. Mica Dust. In London.—2112, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR Sale, Converter or Charging Set, 200 volts, 13·5 amps., 115 volts, 20 amps., with Starter, Switchboard and connections.—WILLIAMS & SONS, 37, Queen Victoria Street, London. 2010

FOR Sale, Motor, 40 H.P., by Siemens, quite new, immediate delivery; protected ventilated type, 240 F.C., 220 volts, D.C., 740 R.P.M. commutation poles and end-shield bearings; also protected type starter, double automatic. The lot £160 net cash, f.o.r. Dagenham.—STERLING TELEPHONE & ELECTRIC Co., LTD., Dagenham, Essex. 2139

FOR Sale, Motor-Generator, by the G.E.C., 500 volts, 225 amps., with two series-wound boosters, 110 volts, 400 amps., 650 R.P.M.—WILLIAMS & SONS, 37, Queen Victoria Street, London. 1996

FOR Sale, reliable Motor-Generator, D.C., 100 volts to 6 volts output, 105 watts, with switchboard for charging accumulators; also one accumulator switchboard, complete for 200-volt battery.—BUCHANAN & CURWEN, 36, Baldwin Street, Bristol. 5115

FOR Sale, second-hand shunt Dynamo, 50/75 volts, 10/12 amps., good condition.—PARSONS, Electrician, Hull. 5139

FOR Sale, six marine-type dry-back Boilers, 13 ft. × 11 ft.; 180 lbs. working pressure.—Box M 924, c/o Dawson's, 121, Cannon Street, E.C. 4. 2071

FOR Sale, 120-H.P. D.C. Motor by the G.E.C., shunt wound, 500 volts, 650 R.P.M.; now fixed. Immediate delivery.—WILLIAMS & SONS, 37, Queen Victoria Street, London. 1994

FOR Sale, 500-KW. Parsons Turbo-Alternator, three-phase, 2500 volts. Seen working.—WILLIAMS & SONS, 37, Queen Victoria Street, London. Telephone, City 3938. 1995

LAMP Caps on sale.—50,000 selected metal filament Lamp Caps suitable for re-manufacture.—HAMPSONS, 141, Higher Cambridge Street, Manchester. 4929

MOTOR-Generator, 200/20 volts, 70 v., 80 amperes, suit linemen. —THE FARAD ELECTRICAL Co., LTD., Farad House, West Hill, Wandsworth. 5094

ONE 2½-H.P. Horizontal Gardner Oil Engine, belt-driven on same bed-plate to Crypto Generator; 75 volts, 17 amps., with Shunt Regulator, complete with Cooling Tank and Piping. Perfect condition.—Offers to 2158, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR SALE.—*Continued.*

ONE 200-KW. Steam Generating Set for immediate sale, Willans-Mather & Platt, 220 or 440 volts. Perfect working condition.—JENNINGS, West Walls, Newcastle-on-Tyne. 1513

OZONAIR Apparatus, type 59, for direct current, with Motor-Converter and 10,000-volt coil; perfect condition.—PHOTECTOR, Central Hall, Southall. 5146

PETROL Set, 70 v., 80 a., Crypto; Motor-Generator, 220 v. to 70 v., 80 a.; ditto, 480 volts to 66 v., 80 a.; ditto, 440 v., two-phase, 50~, to 100 v., 20 a.; ditto, 220 v., single-phase, 50/60~, to 60 v., 60 a.; ditto, 110 v., 60 ~, single-phase, to 85 v., 35 a.; ditto 100/200 v., single-phase, to 70 v., 10 a. Several Gas and Oil Engines.—5188, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

PLATING Dynamos, 50, 100, 200, 2500, 3600, 15,000 amp., immediate delivery.—5184, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

STEAM Engine, 5" by 5", coupled to pump 5" delivery, by Gwynnes.—Can be seen at NORVALL'S, 242, Goswell Road. 5177

TELEPHONES. Several second-hand Magnetos, &c.—5159, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

THREE Igranic self-acting Starting Rheostats, for 500-volt D.C. Motors up to 10 H.P. Suit pumps, printing machines, lift compressors, &c. Condition perfect.—DRUMMOND & Co., Middlesbrough. 4842

THREE 8-H.P., 220-volt, brand new, shunt-protected Motors, 1600 revs.; just unpacked.—DRUMMOND & Co., Middlesbrough. 4839

TWO 250-KW. Belliss Alternator Sets, each comprising a Compound Enclosed Engine, with E.C.C. Alternator, 3000 volts, 50 periods; quite modern, and for immediate delivery.—HARRY H. GARDAM & Co., LTD., Staines. 1852

VACUUM Cleaner, "Royal" Universal, for direct current; almost new, with four cleaning tools.—PHOTECTOR, Central Hall, Southall. 5145

5-inch Gwynne Centrifugal Pump, direct coupled to 17-H.P., 460-volt, shunt Westinghouse Motor, with control panel, only used short while; condition perfect.—DRUMMOND & Co., Middlesbrough. 5189

10-H.P., 2-phase, 200 v., 50 ~ Motor complete, £47 10s.; 6, 20, 25, 30, 50, 60-H.P., same supply; single-phase Motors, ½10 H.P., 100/200 v.; several 190-H.P., 3-phase, 550-v., 50~ Motors; 1, 30, 50, 100-H.P., 3-phase Motors, 440 v. 50 ~, complete, to be sold cheap.—5186, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

15-H.P., 480-volt, series-wound Crane Motor, by Westinghouse; also one 16-H.P., totally enclosed, by B.T.H. Seen running.—DRUMMOND & Co., Middlesbrough. 4843

18-H.P., 440-volt, compound-wound, enclosed ventilated Motor, 1100 revs. Perfect order.—DRUMMOND & Co., Middlesbrough. 4841

25-H.P., 3-phase slip-ring Motor, by Siemens, 440 volts, 60 cycles, with short-circuiting device; also complete starting gear.—DRUMMOND & Co., Middlesbrough. 5054

44-KW., 110-volt D.C. Generator, compound wound, three-bearing type, with rope pulley and slide rails; speed, 600.—DRUMMOND & Co., Middlesbrough. 4895

70-VOLT, 300-amp. Bipolar, Compound-wound Dynamo, by Holmes; speed, 900; perfect order.—DRUMMOND & Co., Middlesbrough. 4893

100-KW., 220/240-volt, 6-pole Generator, compound interpole 3-boring type. Perfect order.—DRUMMOND & Co., Middlesbrough. 5053

110 VOLTS, 50 amp., two-pole, A.E.C. Dynamo, in good condition.—J. D. CHAMBERS, Central Electric Supply, Newark. 5081

500-KW. Steam Set, comprising triple-expansion enclosed engine, coupled to Westinghouse multipolar generator, 440/490 volts, D.C. For prompt delivery.—HARRY H. GARDAM AND Co., LTD., Staines. 1413

500-KW. Steam Generating Set, comprising a Belliss triple-expansion engine, coupled to an alternator by the Electric Construction Co., Wolverhampton, 3000 volts, 50 periods, with Wheeler-Worthington independent surface condensing plant; modern plant in first-class condition, and for immediate delivery.—HARRY H. GARDAM & Co., LTD., Staines. 1851

ARTICLES WANTED.

WANTED IMMEDIATELY.

LARGE Stocks of 5-amp. P.B. Switches on cream base. 5 and 10-amp. coupled switches on polished wood blocks, hard wood adaptors, rosewood and walnut adaptors and composition adaptors. Prices must be keen.—2145, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

(Continued on next page.)

ARTICLES WANTED.—*Continued.*

ENGINE OR DIRECT-COUPLED SET.

WANTED at once Oil or Gas Engine, preferably vertical type, about 50 B.H.P.

A Direct-Coupled Set, 220 volts, D.C. would be suitable.

Plant must be in good condition and seen running.

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SMALL PETROL or Paraffin House-Lighting Sets wanted from ½ to 4 KW., new or second-hand; must be in good working order. Reply to—

OVERSEAS ENGINEERING CO., LTD.,
75, Curtain Road, London, E.C. 2. 2165

Cheap prepaid Advertisements are inserted under this heading at the rate of One Penny Per Word (minimum 1s.).
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ACCUMULATORS wanted for refining purposes. Obsolete Generating Sets, Dynamos, Motors, and all kinds of Machinery. Scrap Cable, Arc Lamps, Meters, Metal Residues, and Scrap Metals of every description purchased for prompt cash, town or country.—Apply A. BROWN & SONS, 142, Lower Clapton Road, London, N.E. Telephone: Dalston, 555. Telegrams: Secondhand, Lowclap, London. Established 1860. 4358

A.C. and D.C. Motors (second-hand), any type, any condition, wanted for prompt cash.—A. LEAROYD & SON, Bridge Works, Heatherley Street, Clapton, N.E. 4765

A. LEAROYD & SON, Bridge Works, Clapton, N.E.—Telephone Dalston, 2278; Telegrams: Frangible, Lowclap, London—buys for prompt cash every description of second-hand Generating Sets, Accumulators, Motors, Transformers, old Arc Lamps, Meters, Cable, Scrap Metals, Metallic Drosses, &c., &c. Enquiries solicited. Established over 50 years. 4766

A 1 CASH Prices given for Electric Cable, Flexible Wire, Electrical Accessories, &c.—Apply DAVIS, 11, Sun Street, E.C. 2. 1424

A 4-H.P., 460-V., D.C. Motor, about 1000 R.P.M., wanted.—NORTHERN ELECTRICAL CO., Grimsby. 5144

ACCUMULATORS, one set for 100 volts, suitable for 100 20-watt lamps, second-hand or new.—5166, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ALL for Munition purposes.—Obsolete Motors, Dynamos, Insulated Cable, and every description of Electrical Plant bought to break up. Send us your stocks of scrap metals.—G. H. CHAPPELL SONS & CO., Midland Wharves, Lea Bridge Road, Leyton, N.E. 'Phone:—Walthamstow 500. Estab. 40 years. 4707

D.C. Generator, 230 volts, 80 to 100 amps., second-hand, first-class condition.—Write W. D. WILSON, 9, Booth Street, Bradford. 2176

DYNAMOS, Motors, Arc Lamps, Meters, Scrap Cable, Iron, Metals or Machinery purchased for cash in any quantities.—J. HYAMS, 11, Glengall Terrace, Old Kent Road, S.E. Telephone: 3339 Hop. 5158

HAUSE Dynamo Lighting Set, 4 KW. capacity or near. Engine must be petrol-paraffin. Set with accumulators preferred but not essential.—PORTHOLME, St. John Street, Huntingdon. 2058

OIL-driven Electric Light Plant wanted 100 or 50 volts with battery complete, about 200 to 300 ampere-hours capacity.—5169, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

OLD Cable urgently required, also Lamp Tops.—WALLACE, Cromwell House, High Holborn. 4114

OLD Electric Lamps that have had wire-drawn tungsten filaments in them previously wanted, glass parts intact. Agent's price 2d. each.—847, Harrow Road, London, N.W. 10. 4932

OLD Electric Lamps with glass intact.—104, Craven Park, London, N.W. 10. 5049

PLATINUM, in any form and quantity, purchased at highest prices by DERBY & CO., LTD., 44, Clerkenwell Road, London.

SMALL Dynamo, about 30-50 volts, 15-20 amps. Also Switchboard, with regulating resistance, set suitable to charge small car batteries.—A. H. KING, 118, Bridge Road West, Battersea. 5148

SMALL Transformer 250/105 volts, 40 periods.—BUCHANAN AND CURWEN, 66, Victoria Street, Westminster. 5153

STEEL Tubes, all sorts, wanted; Lampholders and Metal and Cardboard Shades; Gas Lighters, Static Electric; Screws, round head, and Hexagon Nuts.—DUGDILLS, Failsworth, Manchester. 5052

ARTICLES WANTED.—*Continued.*

TWO Steam Generating Sets, 45 KW., 200/250 volts, D.C., vertical type complete; suitable for 100 lbs. pressure. No condensing plant required.—5163, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, a few 400-volt, 50-cycle, 3-phase Motors, preferably slip-ring type, 5 to 35 H.P.—8133, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, a 400-KW. D.C., 500/550-volt, compound-wound Dynamo, without prime mover, for use on electric traction, and on electric lighting. State speed, price, and where to be seen; to G. P. SHALLCROSS, Electrical Engineer's Office, Craven Street, Birkenhead. 2135

WANTED, Concentric Cable, 7/18 lead covered, armoured, 100 ft. Also Meter, 200 v., 50 periods, single phase.—CLEMENTS AND SON, 22, London Street, E.C. 3. 5194

WANTED, D.C. Motor, second-hand, 7 to 10 H.P.—5191, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, for direct-coupling to high-speed steam engine, 500 revolutions, 30/40 KW. Generator, any standard voltage, but preferably 220 D.C.—Reply, stating maker, price and full details, to 1639, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Generating Sets, all sizes, Boilers, Accumulators, Dynamos, &c., for export: also Scrap Cable and Metals, Complete plants purchased.—WILLIAMS & SONS 37, Queen Victoria Street, London. Telephone: 3938 City. 7000

WANTED Immediately, Steam Engine and Dynamo, output about 15 kilowatts, 100 lbs. pressure, 100 to 250 volts.—Full particulars and price to BOOTH & BOMFORD, LTD., Electrical Engineers, 21, Castle Street, Cardiff. 5150

WANTED immediately, 54-cell Batteries, in glass boxes; 500 and 200 amp.-hour sizes. State age, make, locality and lowest price on rail.—KEATINGE & GAULE, Waterford. 5087

WANTED, Imperial Vacuum Cleaner for 100-volt circuit; shunt Dynamo, 70 v. 15-20 a.; Crawley Automatic Switch for 27 cells; small Accumulator Switchboard for 15 a. 50 v.—E. POWELL, Ltd., Tunbridge Wells. 5164

WANTED, modern Dynamo, 30 to 40 KW., compound, 110 v. Full particulars with price only entertained.—5173 ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, one shunt or compound-wound Dynamo, 220—230 volts, 500 to 600 R.P.M., about 100 KW.—2081, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, one 5-H.P., 480-volt, D.C. Motor, 1200 R.P.M., pulley 4".—5149, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Rotary Converter, 250 KW., either three or six-phase, for traction supply, D.C. voltage 500 to 550, without transformers.—Full particulars, condition, and date of manufacture, to GENERAL MANAGER, Tramways, Atherton, Lancs. 2187

WANTED, second-hand Accumulator, 53 cells, 300 ampere-hours capacity.—2161, ELECTRICAL REVIEW, 4, Ludgate Hill, London

WANTED, second-hand Battery, 27 2-volt cells in glass boxes, complete with acid and all accessories, capacity 30 to 40 amps. for 10 hours. State price, where battery can be seen, and size of cells.—Write Box 4432, c/o Brown's, 39, Tothill Street, Westminster. 5142

WANTED, second-hand 65 v. Dynamo, about 1 to 2-KW. State winding, price and full particulars.—PARSONS, Electrician, Hull. 5138

WANTED, to hire or purchase, a few 200/220-volt, 50 or 70-cycle single-phase Motors, with starting switches; sizes, 2 to 6 H.P.—Particulars to ENGINEER, Electricity Works, Redditch. 2120

WANTED, two A.C. Motors, 110 volts, 60 periodicity, 20/30 H.P., single phase.—Particulars to CRYSELCO LIMITED, Kempston Works, Bedford. 1826

WANTED, vertical compound high-speed Engine, 80/100 H.P., enclosed, self-lubricating type, by well-known maker preferred. Send price and full details, to 1638, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, 5 to 7-H.P. 550-volt Shunt or Compound-wound Motor, together with starting switch and resistance.—Particulars to THE MANX ELECTRIC RAILWAY CO., LTD., Douglas, I.O.M. 2055

WANTED, 10-KW., 200-volt, 50-period, single-phase Alternator, separately excited for 240 D.C. supply or fully excited; open to accept any such alternator, or tapped or ordinary rotary converter up to 20 KW.; immediate delivery essential; new or second-hand.—DENTAL CHAIR & ENGINEERING CO., LTD., 3, Finchley Road, N.W. 8. 2148

WANTED, 100/250-KW. Vertical Gas Engine, with 220 volts. Generator preferred.—1997, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

(Continued on next page.)

ARTICLES WANTED.—*Continued.*

WANTED, 150-KW., 220-v. Generating Set: 30' × 8' Boiler 5-ton Travelling Crane, electric preferred; two 50-H.P., 220-volt Motors.—MARTINS, 320, Witton Road, Birmingham. 5103

350-AMP.-Hour Battery, 110 volts. Must be in good condition.—Offers and price to 2159, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

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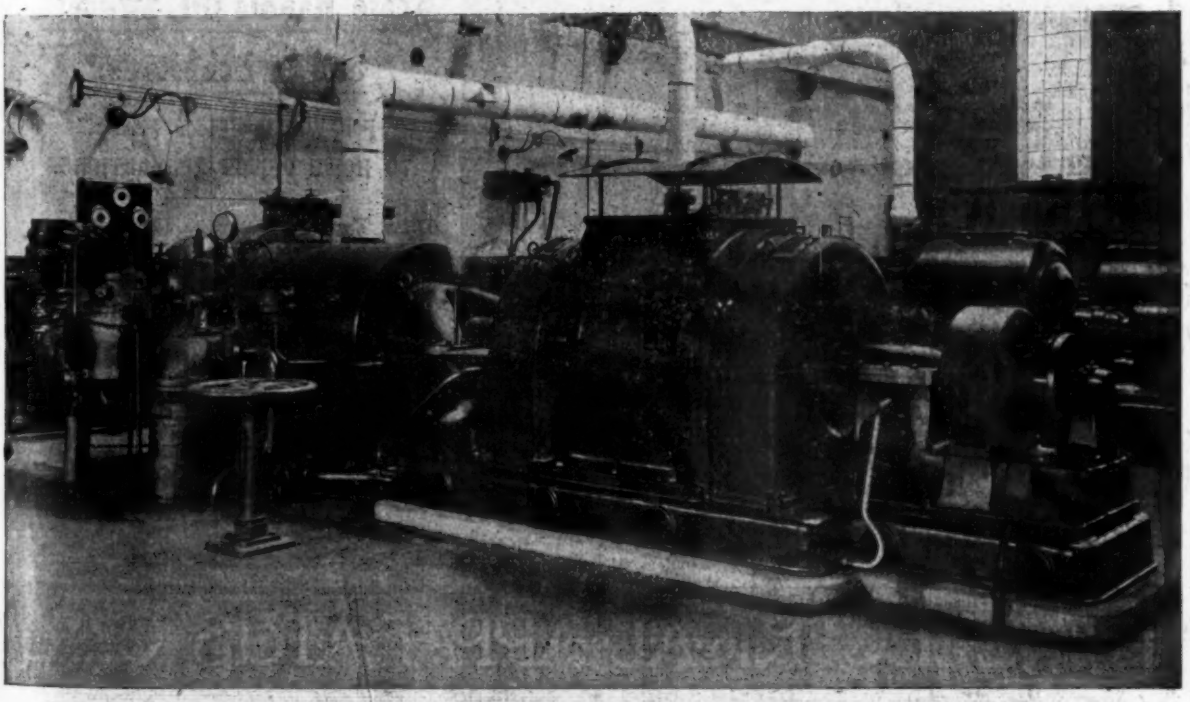

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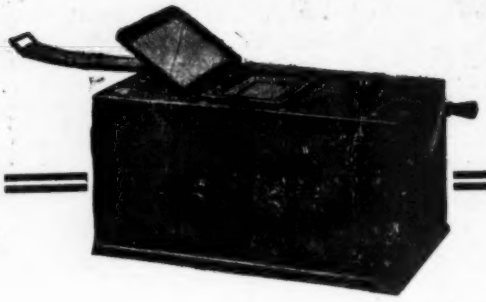

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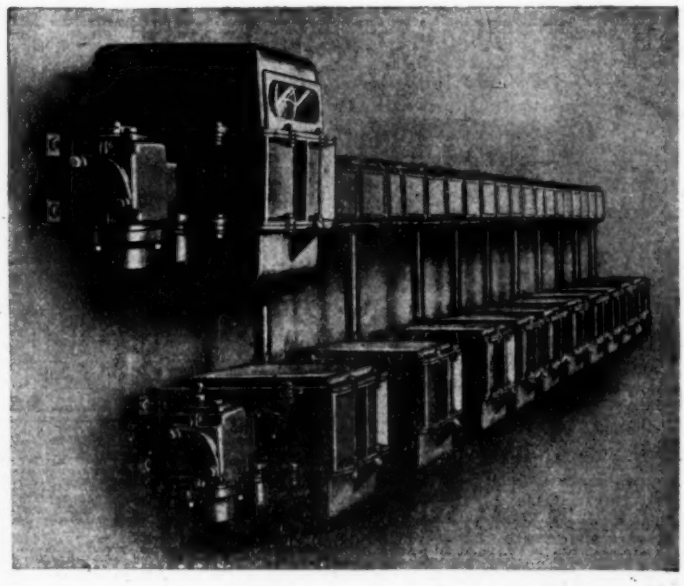

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NEWCASTLE-ON-TYNE. 65, BLACK STREET. CITY, 657.

NOTICES RELATING TO PATENTS.

Latest time for receiving 9.30 a.m. Thursday.

John E. Raworth,

Queen Anne's Chambers, 28, The Broadway, Westminster, S.W.1. **Chartered Patent Agent.**

SEFTON-JONES, ODELL & STEPHENS,
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285, HIGH HOLBORN, W.C. 1.

ADVERTISER desires to get into touch with a Firm of Manufacturing Electrical Engineers, with a view to the purchase of or working of his Patent for recording and indicating at any distance electrically the speed of engines, shafting, &c.—5190, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

THE Owner of Patent No. 115,973 invites correspondence from those interested with a view to the sale of rights.—5152, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

OFFICIAL NOTICES.

Latest time for receiving 9.30 a.m. Thursday.

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THE COMMISSIONERS OF HIS MAJESTY'S WORKS, &c., are prepared to receive Tenders before 11 a.m. on WEDNESDAY, the 31st JULY, 1918, addressed to the SECRETARY, H.M. Office of Works, Storey's Gate, London, S.W. 1, for the

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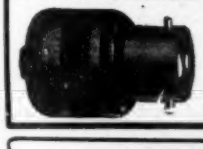
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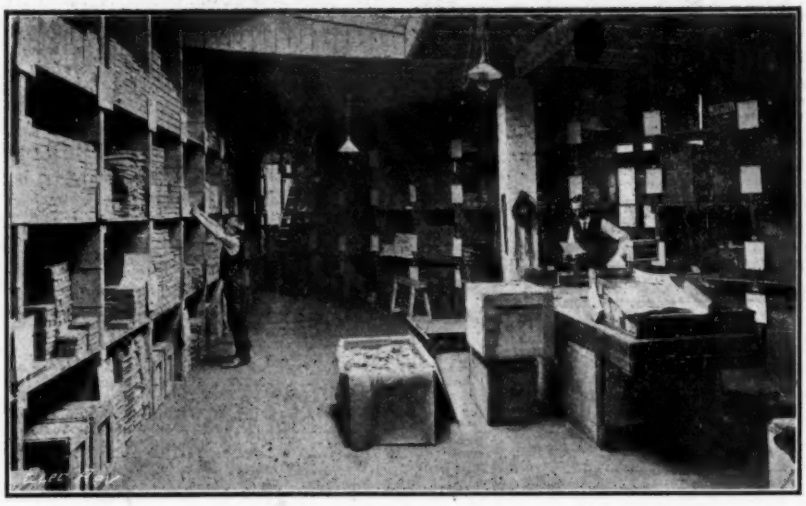

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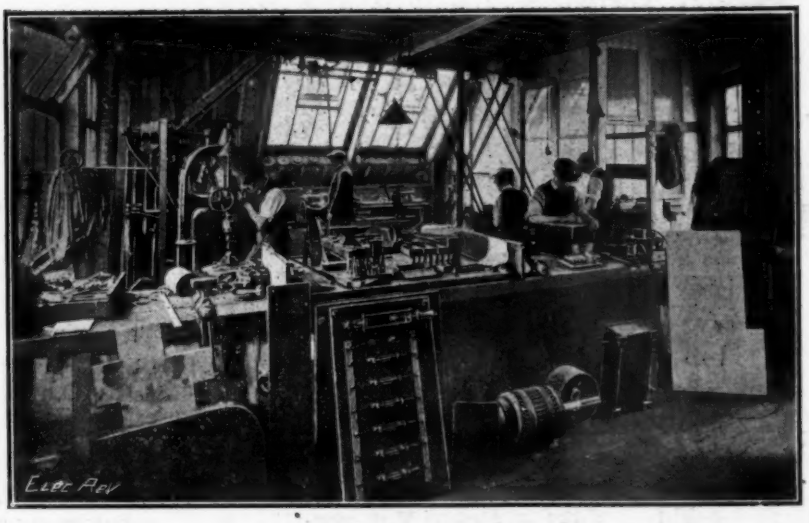

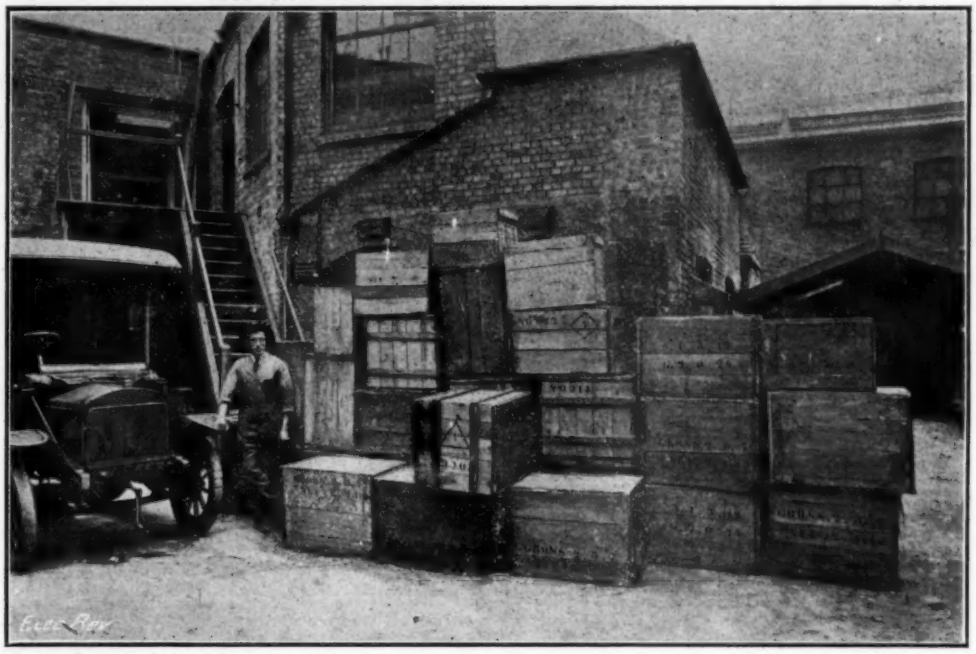

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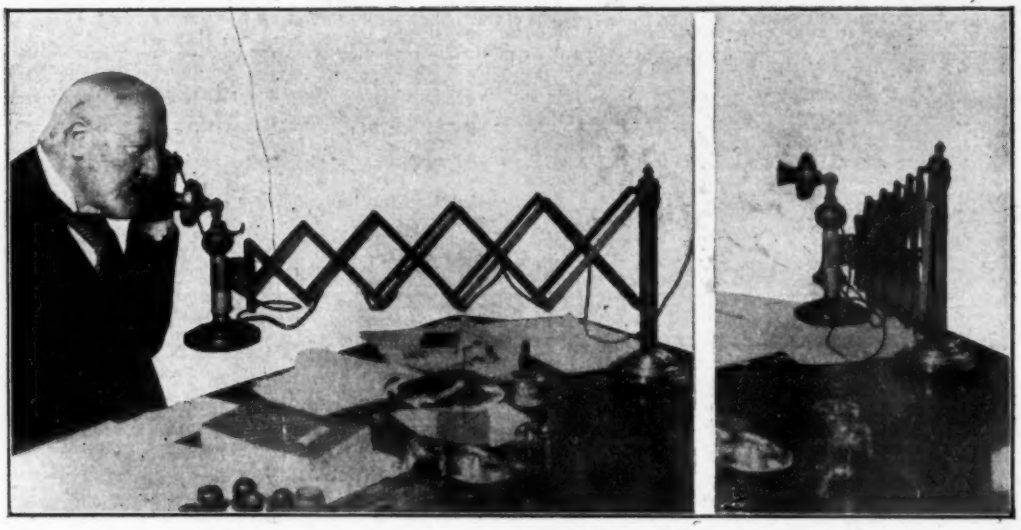
" anywhere within a radius of 42 ins. when in use.

" elevated away from the paper when in use or out of use.



THE "LAZILITE" TELEPHONE ATTACHMENT, IN USE AND "AT REST."

One instrument easily accessible by two or more people without disturbing the other man.

Roller bearing where greatest stress occurs.

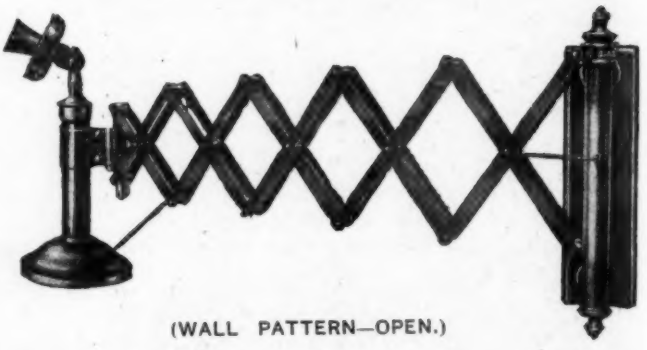
No twisting of cord.

Cord is absorbed in the fitting open or closed.

Price

Oxydised Copper Finish, Bracket or Wall Pattern

50/- each.



(WALL PATTERN—OPEN.)

LEAFLET T3198 AND ATTRACTIVE TERMS FOR RESALE FREE ON REQUEST

To THE EDISON SWAN ELECTRIC CO., LTD.,

PONDERS END, MIDDLESEX.

Depots and Branches :

123/5, QUEEN VICTORIA ST., E.C. 4
BELFAST.
BIRMINGHAM.
BRISTOL.
CARDIFF.
CORK.
DUBLIN.
DUNDEE.
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ENGLISH EDISWAN EVERYTHING ELECTRICAL.

71, VICTORIA ST., S.W. 1
HULL.
LEEDS.
LIVERPOOL.
MANCHESTER.
NEWCASTLE.
NOTTINGHAM.
SOUTHAMPTON.

Short break, compact size, low watts loss, and small amount of metal volatilised on short circuit

—instance the principal FLUVENT advantages which have made it possible to introduce a system of ironclad distribution fuse power-boxes, compact in size, whilst affording ample clearance.

HOPE'S PATENT

Fluvent

REGD. TRADE MARK

THREE-PHASE & D.P. FUSE BOXES

In mounting FLUVENT boxes the bases are assembled on steel rods carried in insulated brass bushes, which by outside tightening rigidly clamp the bases together, thereby keeping all space behind them perfectly clear of any supporting pillars. Moreover, the trouble of screwed-down china bases cracking is overcome here, where free expansion in length is obtained.

The FLUVENT Fuses employed are built up of standard units, have complete china insulation, comply with H.O. regulations, and ordinary copper wire is used. Regarding this latter feature

The Fuse Wire reaches dull red heat at 89% of its blowing current

instead of 75% as in other Fuses. For Power consumers the FLUVENT is best.

Many other special points of the above board are explained in our Catalogue.

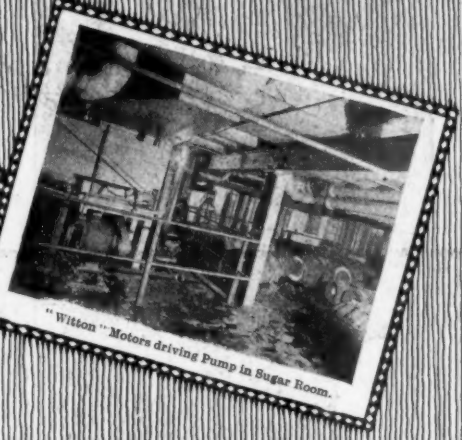
PARMITER, HOPE & SUGDEN, LTD.,

Hulme Electrical Works, MANCHESTER.

London Office: 25, Victoria Street, S.W. 1. Scotland: David Alexander, Mains St., Waterloo St., Glasgow.
Birmingham & Midlands: S. Thos. Pemberton & Co., 7, Church St., Colmore Row, Birmingham.

G.E.C.

"Witton" Motors driving Pulp Cleaners.

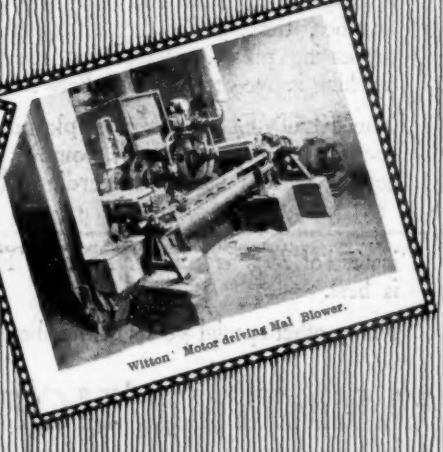


"Witton" Motors driving Pump in Sugar Room.

"Witton" Motors driving Bottling Stores.

"Witton" Motor driving Chaff Cutters, Dust Extractors, &c.

"Witton" Motors driving Grain Dryers.



"Witton" Motor driving Mal Blower.

REGISTERED TRADE MARK

G.E.C.

Industrial Electrification.

No. 12.—BREWERIES.

FEW more opportune cases for electrification exist than that of brewery drive, due to the large area covered and the many-storeyed buildings, which are common in brewery construction. The application of the motors to pumping, grain drying, bottling, malt hoists, centrifugals, and in the transporting of barrels and of the raw materials about the works has been closely studied by the G.E.C. experts, who are able to prescribe suitable drives for many of the difficult circumstances met in some of the departments.

Particularly does this apply to the arrangement of the wiring, which is very prone to faults in the moist atmospheres unless laid down under the care of experts thoroughly cognisant of brewery conditions.

The General Electric Co. have also paid special attention to the arrangement of the power house plant, with a view to the generation of the steam required for heating, its utilisation in the engines, and its subsequent distribution to the vats with a minimum of loss.

Illustrations on the opposite page are typical of brewery electrification practice as undertaken by the G.E.C., who have electrified some of the largest breweries in the country.

The experience of the Company's Industrial Electrical Engineers is at the disposal of brewery engineers and managers, and of supply authorities having breweries within their supply area, and they are invited to consult the G.E.C. regarding any extensions contemplated either immediately or in the future.

Next Week - - - - STEEL WORKS.

The General Electric Company, Ltd.,

Head Office: Queen Victoria Street, London, E.C. 4.

Telephones: London Wall No. 3600 (30 lines). *Telegrams:* "Electricity Cent. London."

BRANCHES—

Manchester—Victoria Bridge.
Liverpool—Church Alley.
Leeds—Wellington Street.
Sheffield—Angel Street.
Glasgow—Waterloo Street.
Cardiff—Womanby Street.
Bristol—Victoria Street.
Swansea—Wind Street.
Newcastle-on-Tyne—Gallowgate.
Hull—Charlotte Street.
Ipswich—Princes Street.
Southampton—High Street
Aberdeen—Bridge Street
Birmingham—High Street.
Nottingham—Chapel Bar.
Belfast—Queen Street
Dublin—Trinity Street.
Cork—Grand Parade.

REGISTERED TRADE MARK

LOW STARTING CURRENT— **Century** FRACTIONAL HORSE POWER

SINGLE-PHASE MOTORS

require less than three times full load current when starting.

When connected on lighting circuits they enable the exacting Central Station Operator to maintain good lighting service even though the apparatus may be required to start frequently—it also makes it possible to use a fuse which will really protect the motor.

Other sizes up to 40 h.p.

REPULSION—START INDUCTION TYPE.

THEY KEEP-A-RUNNING.

1/6-H.P. Motor belted to a pump, forming part of a house water system.

Manufactured only by

CENTURY ELECTRIC COMPANY,
19th Pine to Olive Streets, St. Louis, Mo., U.S.A.

A STOCK OF "CENTURY" MOTORS IS CARRIED IN LONDON BY—

The Sole British Agents—

SWEDISH GENERAL ELECTRIC, LTD.,
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Sales Manager: R. A. MARPLES.
Telegrams: "Autosyncro, Westcent, London." Telephone: Holborn 1703.
218

ACTUAL MANUFACTURERS.

TAPES, WEBS, SLEEVINGS,

For all classes of Electrical Work.

Large Stocks kept.

Samples by return on application.

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Telegrams: "Hardson, Manchester." Telephone: 6471 Central.
LONDON: 3, Fitchett's Court, Noble Street, E.C.
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ALTERNATING AND DIRECT CURRENT.

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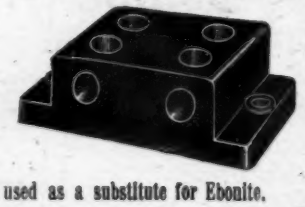
SEND US YOUR ENQUIRIES FOR MOULDED INSULATING ARTICLES.



Our composition can be used as a substitute for Ebonite.

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Opposite Agricultural Hall,
ISLINGTON, N. 1.
Telephone: NORTH 1345.

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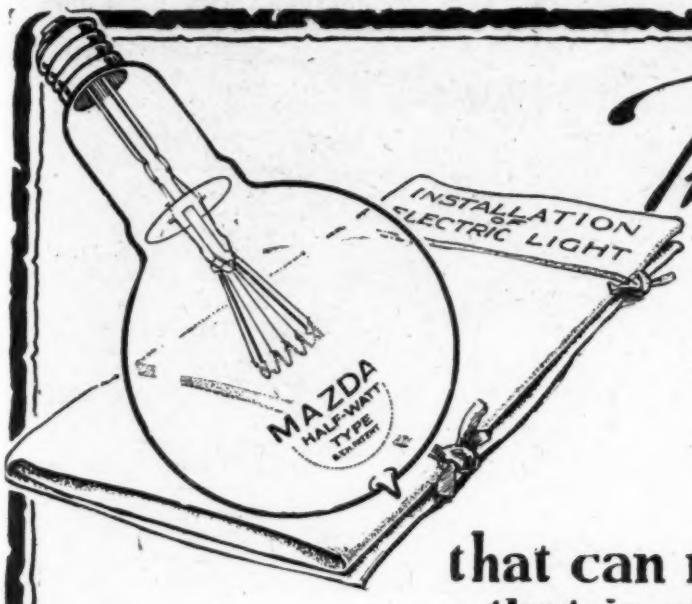
THE ONLY SUCCESSFUL "TURN-DOWN" ATTACHMENT FOR ELECTRIC LIGHT.

PASS & SEYMOUR INC. 6, CHURCH ST., NEW YORK, U.S.A.

5 DIFFERENT CHANGES OF LIGHT!

SUPPLIED IN TWO TYPES: LOW VOLTAGE (90 to 130 V.) and HIGH VOLTAGE (200 to 250 V.).

BENJAMIN ELECTRIC, LTD., Brantwood Works, Tariff Road, Northumberland Park, Tottenham, N.17.



The Lighting Contract

that can never be broken
that is always fulfilled.

EVERY Mazda Half-Watt Lamp contains on its bulb a complete lighting contract.

It is an undertaking to supply the best possible light at the lowest possible cost in current.

It is a one word contract—and that one word is "Mazda."

"Mazda" is the word by which you can identify the lamp that offers the consumer a remarkable lighting contract and fulfils it with scientific precision.

Mazda Half-Watt Lamps will enable you to guarantee efficient and economical lighting as part of your wiring service.

Instal

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MAZDA
HALF-WATT TYPE
ELECTRIC LAMPS

MAZDA SALES COUNTER.

The Sales Counter at Mazda House is a model of convenience and good service. You haven't to climb stairs or wander from one department to another to collect your purchases. The Sales Counter collects them for you. It makes ONE job of ALL your requirements and saves you time and trouble.

E 93.

Mazda House is the Home of Reliable Wiring Accessories.

Send us your enquiries for every thing electrical you require.

If it's electrical get it from B T-H

We are Specialists in Good Lighting. We design and make Scientific Lighting Appliances and Fittings as well as the Lamps. Lighting Advice and Plans on request.

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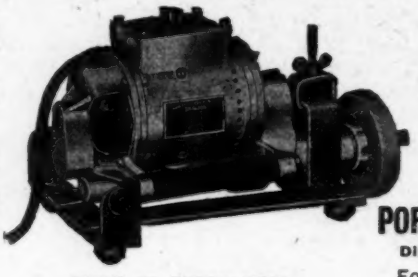
THE LARGEST MANUFACTURERS OF
PORTABLE ELECTRIC TOOLS
FOR ALL PURPOSES.

THE "DUNTLEY" HEAVY DUTY
AIR-COOLED
ELECTRIC DRILLS and GRINDERS
Represent the Last Word in
PORTABLE DRILLING, REAMING, TUBE EXPANDING AND GRINDING TOOLS.
Wound for all Currents and Voltages.
Designed to withstand the heavy overloads incidental to hard and continuous work without damage.

UNIVERSAL
PORTABLE SURFACE GRINDER.



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Sizes of Emery Wheels:
No. 00, 4" × ¾" × ½"
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PORTABLE ELECTRIC DRILLS,
made in various sizes, capacities 5/16" to 2" in metal.

Machines for Engineers,
Shipbuilders,
Iron Founders,
Motor Car Builders,
Motor Garages,
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PORTABLE ELECTRIC BLOWER,
DIRECT AND ALTERNATING CURRENT.
For cleaning the windings of Electrical Machinery and Switchgear.

Write for our latest Catalogue.

General Offices:
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Teleg. Add.: "Caulking," Phone, London.
Telep. No.: Gerrard 9215 (3 lines).
Main Works: FRASERBURGH, SCOTLAND.

London Showroom and Repair Works:
77, 75, 79 & 80, YORK STREET, S.W. 1,
near St. James's Park Station (Dist. Rly.).

The Lusty Lung, with all his might
The praise is sung to friend Fluxite.
Electricians, Plumbers, Gasfitters and other Metal Workers, all sing the Praises of

FLUXITE

as the paste flux that solders even dirty metals without cleaning or corrosion, and joints lead without solder merely by the use of a blow-lamp or blow-pipe. In short, Fluxite

SIMPLIFIES SOLDERING
and Supersedes Lead-Burning.

If desired some solder can be filed into a little Fluxite and the two applied together. Fluxite is a necessity in every tool-kit.

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Of Ironmongers and Oilshops. In Tins, 8d., 1/4 and 2/8.
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PALACE ENGINEERING WORKS,
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DYNAMOS AND MOTORS.
REPAIRS OF EVERY DESCRIPTION.
MANUFACTURERS OF WIRELESS COMPONENTS.

SKATOSKALO BOILER SCALING TOOLS.
SOLE MAKER:
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(N.B.—See my last and next week's Advertisement.)

WATER POWER PLANT.

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Kingsway, W.C. 2

MOTORS

ARTHUR LYON & WRENCH
LIMITED

LIGHT WEIGHT
SMALL DIMENSIONS
HIGH EFFICIENCY
SOUND CONSTRUCTION
EXCLUSIVE DESIGN

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5 H.P.

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Works:
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London Office:
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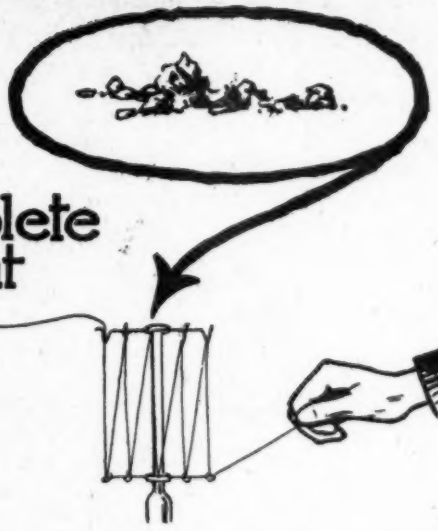
WESTMINSTER, S.W.

From the Tungsten Ore—



to the complete wire filament

Process by process the work is carried out by British labour in our London Works. We do not buy the Tungsten Powder or the Tungsten Rod.

We begin with the Ore, refine and reduce it, work it into rod, swage it down, and finally draw down into the finest filaments.

We are Tungsten and Molybdenum experts.

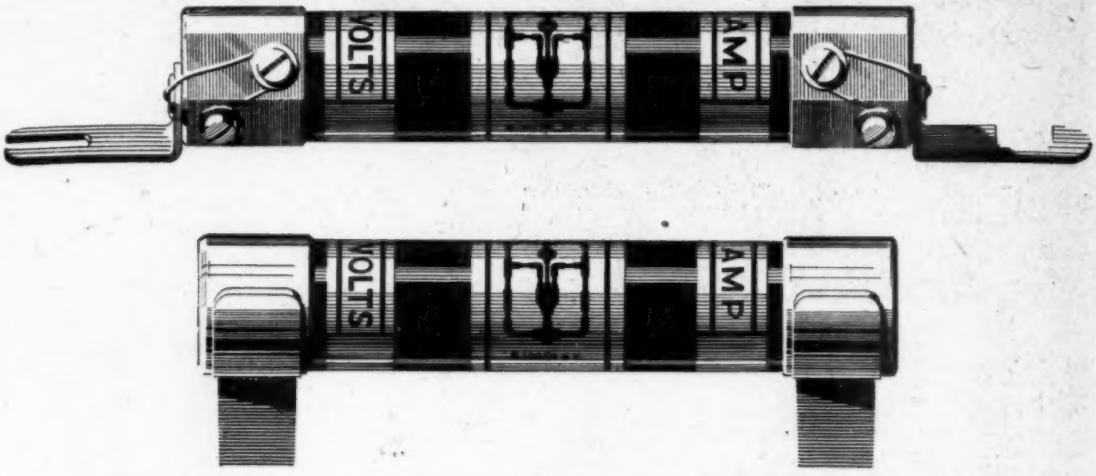
See that your lamps are made with

"Pladuram" Wire

which is the only sure guarantee of a British product from start to finish.

Duram Ltd

Thanet House,
231-2, Strand, London, W.C. 2.



SIMPLEX ENCLOSED FUSES ARE MADE THROUGHOUT at our Birmingham Works, under expert supervision,

Owing to their accuracy in working under practical conditions, within the closest possible limits, they have now become recognised as the best protection for lighting and power circuits it is possible to adopt.

We are able to supply from stock "Repair Outfits," which consist of reels containing the well-known Simplex Fuse Wire ranging from 1-10 ampere capacity.

Write to-day for Samples.

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Works: Garrison Lane, BIRMINGHAM.

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Maker of Presses, Press Tools & Punches

Of Every Description for Electrical and Mechanical Engineers. BLANKS, WASHERS, PRESS PIERCINGS, DIE STAMPINGS IN STEEL, BRASS OR ANY MATERIAL FOR THE TRADE.

LABELS and NAME PLATES A SPECIALITY.

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ENGRAVED CAST PRESSED PRINTED
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CROFT, near LEICESTER.

CROFT ADAMANT CELLWORK FOR E.H.T. EQUIPMENT.

URGENT REWINDING,

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Send to—

ELLERD-STYLES, 81, ROSEBERY AVENUE, E.C. 1.
'Phone: 1440 Central.

For Effective Impregnation

use "LACWATT" BLACK OR GOLDEN BROWN

Booklet on Electrical Varnishes and Compositions free by post.

JENSON & NICHOLSON, LTD. Stratford, London, E.15.

CAPPER PASS & SON, Ltd.,

BEDMINSTER SMELTING WORKS, BRISTOL.

Sellers of ANTIMONIAL LEAD of all Grades

BUYERS OF

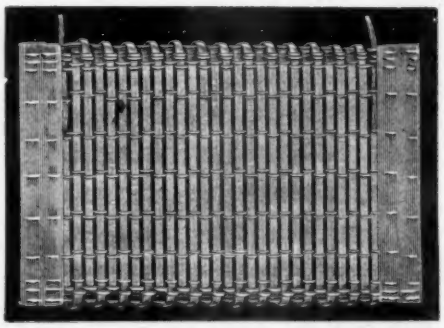
LEAD ASHES & LEAD RESIDUES from ACCUMULATORS.

Telegrams: "PASS, BRISTOL." Telephone 3475.

CRESSALL

ASBESTOS WOVEN

FLAT-RIBBON RESISTANCE GRIDS



All Grids are sent out marked with the number of ohms resistance, and customers can readily arrange them in series or parallel to suit requirements.

The Grids can be supplied with short or long loops for attaching connections for sub-dividing the grids, also for short-circuiting a few of the ribbons to cut out some of the resistance. If the Grids are supplied with long loops, the above ohmic values will be slightly increased.

All Resistance Grids are provided with selvedges or fixing margins at each end (which are entirely free from wires), ranging from 1 in. wide to 2 in. wide, according to the size of Grids, and are of ample strength for assembling the Grids.

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STANIFORTH STREET, BIRMINGHAM.

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SALFORD MANCHESTER

INQUIRIES FOR HOME & EXPORT RECEIVE PROMPT ATTENTION.

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FOR ELECTRIC LIGHTING, POWER, TELEPHONE, SHOT-FIRING AND ALL ELECTRICAL PURPOSES.

FLEXIBLES

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OF EVERY DESCRIPTION FOR LIGHTING, POWER, TELEPHONES, WIRELESS, AEROPLANES, AUTOMOBILES, SUBMARINES, BELLS & MEDICAL APPARATUS.

COTTON AND SILK-COVERED, ENAMELLED, "PERKA", BELL WIRES, FUSE WIRES, &c.

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"ACME" BLACK ADHESIVE, PURE RUBBER, "MAGOHM", COTTON, SILK AND FELT.

Electrically-Heated
GLUE POTS

ECONOMICAL IN WORKING COST.

Consider the economy effected in using No. 265, which consumes 1 unit only in an 8-hours' day. Remember, too, that "PREMIER"

SINGLE, DOUBLE & TRIPLE

Glue-Pots are in great demand for all important Aircraft, Munition, Dockyard, Railway and Engineering Works.

PROMPTEST DELIVERY.

No. 380 has Cast-iron Glue Vessels, Copper water bath, with water-level gauge. Many sizes.

Quotations for special Glue Heaters sent on request.

PREMIER ELECTRIC HEATERS, Ld.
258-260, Bradford St., BIRMINGHAM

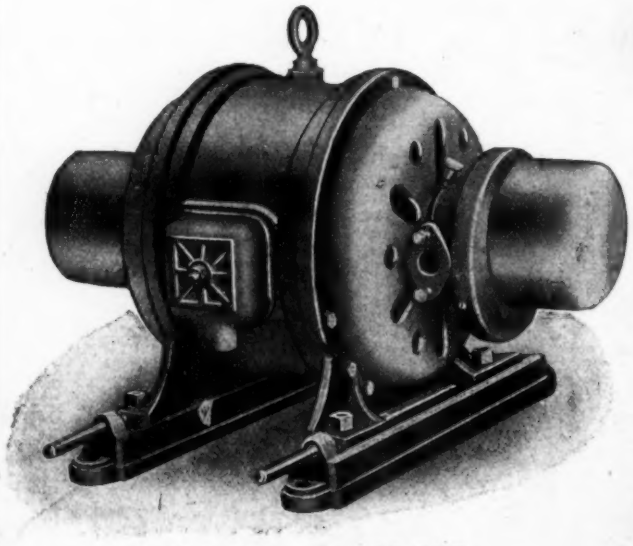
ELECTRIC LIFTING MAGNETS

OUR MAGNETS, built under Eastwood's Patents acquired by us, are not only the most efficient and effective ever produced, but have a longer life under heavy service than is attainable with any other form of construction. Many hundreds of these Magnets in daily operation.

MARRYAT *and* PLACE
28, Hatton Garden, London, E.C. 1

Quick delivery and absolute satisfaction

A.C. only.



Any size up to 200 H.P.

E. BROOK, LTD.,

EMPRESS WORKS, HUDDERSFIELD,

Tel.: 1629-1630. Wires: "Phase."

Also at

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Tel.: 4468 City. Wires: "Phasebroo Phone, London."

and

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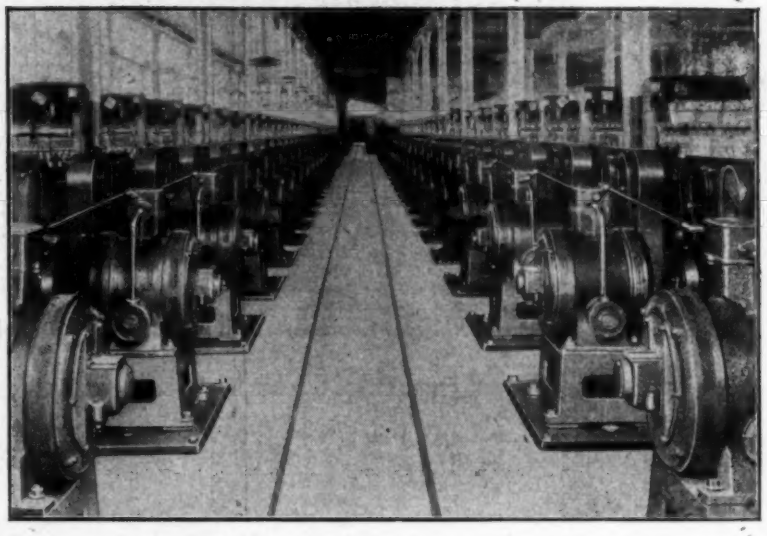
Stocks at London, Leeds, Birmingham & Huddersfield.

2 & 3-PHASE INDUCTION MOTORS

High Efficiency and Power Factors.

S. C. & S. R. Types.



Inter-changeability.

Liberal Clearances.

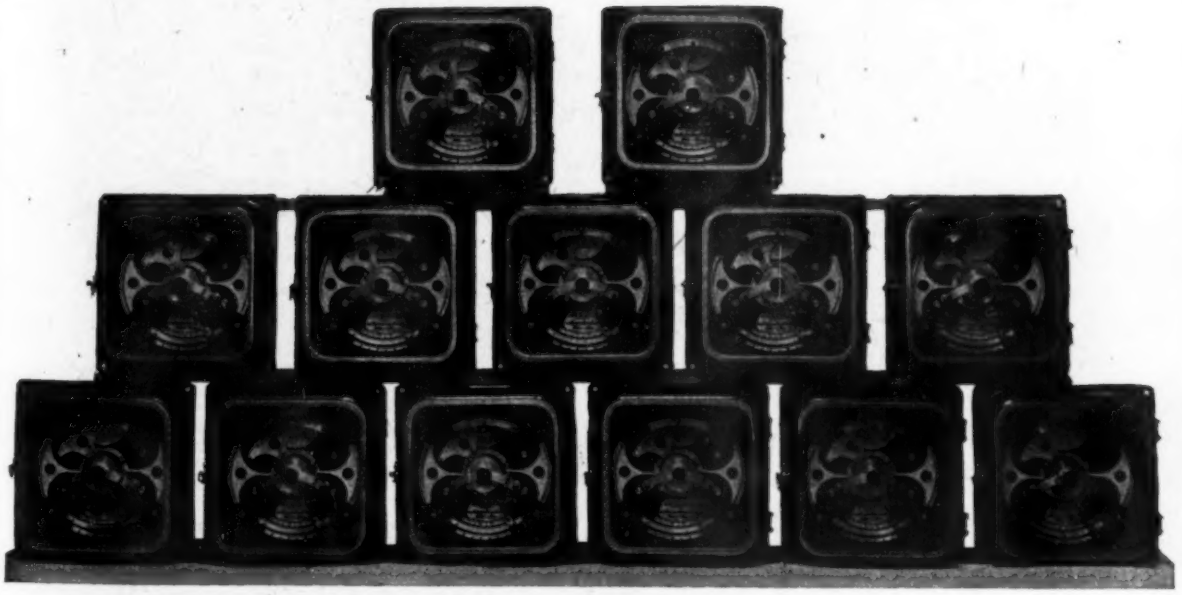
Sound Construction.

WRIGHT & WOOD, LTD.,

Century Works, HALIFAX.

Telephone: 499. Telegrams: "MOTOR."

AUTOMATIC PRESSURE REGULATORS.

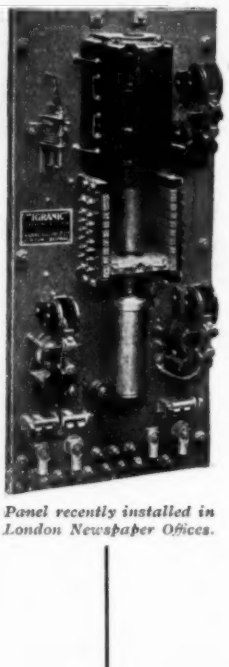


Part of an order for Automatic Pressure Regulator Equipments for the Victorian State Railways.

BROWN, BOVERI & CO., LIMITED, 9, OLD QUEEN ST., WESTMINSTER, S.W. 1

CONTROL
IGRANIC
ELECTRIC
DEVICES

With only Buttons to press, the operator can't go wrong.



Panel recently installed in London Newspaper Offices.

"IGRANIC" AUTOMATIC CONTROL FOR MACHINE TOOLS and PRINTING PRESSES.

Best for the learner or skilled worker.

Saves an immense amount of time in the aggregate by speeding up all control functions.

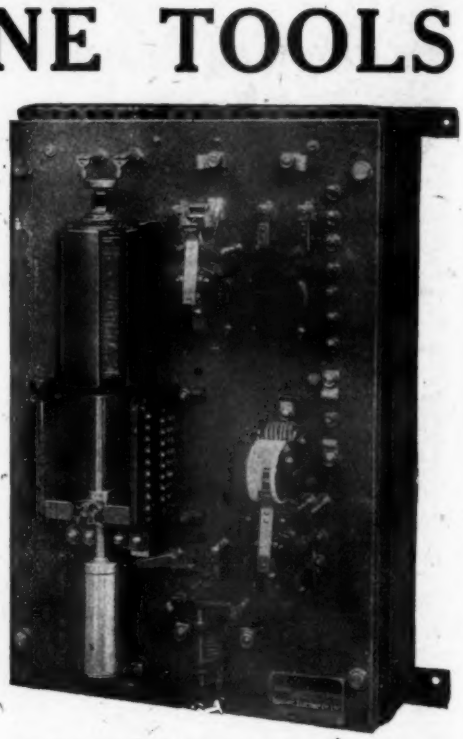
The machinist has no switch to manipulate. Push buttons, installed on the machine, always close to hand, enable him to start, stop, accelerate, slow down, reverse, or apply the dynamic brake instantaneously.

Speed can be altered at any moment without stopping the work.

"Igranic" automatic control is always reliable, properly designed and built.

Twenty-five years' experience insure practical efficiency.

Push Button Station, type No. 450—65.



Typical Automatic Panel, No. 230. Installed on convenient wall or pillar, out of the way.

BOOSTS UP THE OUTPUT, DESPITE LABOUR SHORTAGE.

Write for full description.

IGRANIC ELECTRIC Co LTD

147, Queen Victoria Street, London.

50, Wellington Street, GLASGOW.

Works: BEDFORD.

30, Cross Street, MANCHESTER.

Printed by WILLIAM CATE, LTD., 47-150, Saffron Hill, E.C. 1, and Published by the Proprietors, H. ALABASTER, GATEHOUSE & KEMPE, 4, Ludgate Hill, Lonond, E.C. 4.

Bury.—Price Increase.—The Electricity Committee has increased the price of electricity by a further 10 per cent. as from October 1st next.

Canada.—Toronto.—The seventh annual report of the Hydro-Electrical Commissioners shows that the total income for the year ended December 31st, 1917, was $2,049,383, an increase of $343,200 over 1916. Expenditure amounted to $1,294,023, and, after allowing for interest ($336,382), depreciation ($258,174), and redemption funds ($126,337), $34,467 were carried to the surplus account; 171,691,213 units were sold during the year, against 139,003,756. Owing to a shortage of supply, no new consumers were connected after October.

Carmarthen.—Price Increase.—The T.C. has granted permission for the E.L. Co. to increase the price of energy from 5d. to 6d. per unit.

Continental.—Spain.—E.L. Concession.—The municipal authorities of Villagarcia de Campos (Province of Valladolid) have recently invited tenders for the concession for the electric lighting of the town during a period of 15 years.

Deal and Walmer.—The Deal and Walmer Gas and Electricity Act, 1914 (Extension of Time) has been extended for a further year.

Dublin.—E.L. Restrictions.—The Electricity Supply Committee has given notice that, owing to Government restrictions on coal delivery, the electricity supply must be reduced during the six months commencing September next. Only two-thirds of the units used during last December-March quarter can be supplied, and where more than the allotted two-thirds is used the supply will be cut off for the following quarter. Theatres, and especially picture theatres, will be required to abolish outdoor lighting, and to reduce auditorium lighting. Conditionally upon the carrying out of these regulations the Corporation will try to give the supply necessary for carrying on entertainments. The Committee does not favour the closing of the theatres at 10 p.m., as the saving would be immaterial, but aims at giving a full supply to power consumers who can give satisfactory guarantees that they will not use energy between 4 p.m. and 6 p.m. in November and February, and between 3.30 p.m. and 6 p.m. in December and January. It recommends the discontinuance of shop-window lighting as far as possible, the elimination of outdoor signs, and the reduction of the candle-power of lamps.

Draft regulations to be submitted to the Corporation by the Port and Docks Board in connection with coal economy include the reduction of electricity supply to not more than two-thirds of last year's supply, and the refusal of new consumers during the remainder of the present year. It is also provided that the Coal Controller should have power to prevent private persons or public companies continuing to use coal to generate electricity for power purposes. The proposals, which would also apply to the Gas Co., have excited a good deal of opposition.

Finchley.—Price Increase.—The B.C. has increased the price of electricity for power purposes by ½d. per unit.

Frinton-on-Sea.—Price Increase.—The U.D.C. has received from the B. of T. an amending order authorising the E.L. Co. to increase the charge for energy from 7d. to 9d. per unit for five years. The maximum price is not to be charged in the event of the price of oil fuel falling below a certain figure.

Great Harwood.—Prov. Order.—The B. of T. has granted the Council an extension of its E.L. Order until August 7th, 1919.

Huddersfield.—Proposed Extensions.—The Electricity Committee reported to the T.C. last week that there was an immediate need for extensions costing £90,000. The Committee was prepared to spend the money if the Government would make a grant of a portion of the excess capital expenditure due to war conditions. Up to the present several applications for more power had been refused.

Hull.—Year's Working.—The past year's working of the Corporation electricity department has resulted in a net loss of £4,464, which has been met from the reserve fund. To meet this deficiency and to provide for the future it has been decided to increase the flat rate for lighting by 1d. per unit, making 5½d. per unit, and for other units, except long-term agreements, by 35 per cent. on existing charges. The output in units amounted to over 20 millions, an increase of 3¾ millions on the preceding year. The revenue from all sources amounted to £119,734, and the gross profit was £34,777. With regard to long-term agreements without coal clauses, the engineer recommended that some arrangement be made with consumers on the question of the increased cost of production. During the last quarter of the year the department had had the full use of the 5,000-kw. turbo-alternator, with very beneficial results. The cooling towers were also nearing completion.

Kirkheaton.—Prov. Order.—Having received applications from the Electrical Distribution of Yorkshire, Ltd., and the Huddersfield Corporation for consent to their applications for a prov. order for a supply of electricity within its district, the U.D.C. has decided to support that of the Corporation.

Knottingley.—The 1914 E.L. Order has been extended by a further year to July, 1919.

Lincoln.—Price Increase.—The T.C. has decided to increase the price of electricity to all consumers, including the tramway department, by 20 per cent. Power users under contract are to pay 10 per cent. extra.

London.—Poplar.—Price Increase.—The Electricity Committee has recommended the B.C. to increase the price of electricity, as from July 1st, by 10 per cent. to private consumers and by 25 per cent. to power consumers and for public lighting. This makes a total increase of 30 per cent. and 50 per cent. respectively over pre-war charges.

Year's Working.—In his report for the year ended March 31st, 1918, the borough electrical engineer states that the number of units sold was 20,505,024, a decrease of 2,972,018 compared with the previous year. The net income was £107,366, an increase of £3,488, and the working expenditure amounted to £74,679, against £67,069. Of the gross profit (£32,687), interest absorbed £11,093, and loan redemption £13,296, leaving a net profit of £7,554. Generating costs were ·567d. per unit against ·537d., and the total costs per unit sold were ·874d., compared with ·686d. The engineer states that he has drafted a revised agreement for the inter-working with Hackney, Shoreditch, and Stepney, which, if put into operation, will allow for full advantages to be taken of the linking-up system.

Mexboro'.—Price Increase.—The U.D.C. has advanced the price of electricity to 5d. per unit for lighting purposes and by 5 per cent. for power.

Power Co.'s Bills.—The Select Committee of the House of Commons has approved the preamble of the Shropshire, Worcestershire, and Staffordshire E.P. Bill, the object of which is the erection of a large generating station at Stourport, which is to be linked-up with the Birmingham Corporation's undertaking.

In connection with the Parliamentary Bills of the Rotherham Corporation, the Yorkshire E.P. Co., and the Electrical Distribution of Yorkshire, Ltd., the B. of T. has decided that there should be an amalgamation as regards the electricity supply.

Rathmines.—Strike.—A number of men in the U.D.C. electricity department struck work on July 13th, on the refusal of a demand for £1 per week increase on pre-war wages. The Council had offered 2s., and has now decided to advertise for men to take the places of those on strike. The supply was maintained.

Stroud (Glos.).—Proposed E.L.—The R.D.C. has referred to a Committee, with watching powers, an application by the Stroud E.S. Co. for power to supply energy in the Council's area.

York.—The 1914 E.L. (Extension) Order has been extended for a further year to July, 1919.

TRAMWAY AND RAILWAY NOTES.

Ashton-under-Lyne.—Tramway Lease.—Notice has been given that the Hurst U.D.C. intends, as soon as the consent of the B. of T. is obtained, to grant a lease of the tramways constructed by the U.D.C. to the Ashton-under-Lyne Corporation for a period of five years.

Bingley.—Fare Increase.—The Tramways Committee has recommended that the Bradford Tramways Committee be asked to increase certain fares, and to pay 2·05d. per unit from the date of the proposed increase.

Blackpool.—Proposed Purchase.—The Corporation has opened negotiations for the purchase of the undertaking of the Blackpool and Fleetwood Tramroad Co. With the amalgamation of Bispham and with Thornton's application for amalgamation, more than half the tramroad will be within the borough. The lease to the Tramway Co. is due to expire in about a year's time. The proposal has been approved by the T.C., but has not yet been submitted to the shareholders of the company. It is stated that the offer on behalf of the Corporation is £15 for each £10 share, and to clear off the debenture issue at par, which would mean a total capitalisation, so far as the Corporation is concerned, of £260,000. It is expected that when amalgamation with St. Anne's and Lytham arrives the Corporation will probably negotiate for the purchase of the Blackpool, St. Anne's and Lytham Tramway Co., though nothing has, so far, been done in this direction.

Bradford.—Wages.—The Committee on Production has given its award on the demands of the tramway employés for a 12½ per cent. bonus on present gross earnings and for the same rate of pay for women as for men. An extra 5s. per week has been awarded to the men, making 25s. per week over pre-war rates. The Committee considers that the claim of the women has not been established, and their pay will remain at 13s. over pre-war rates.

Canada.—BRITISH COLUMBIA.—Demands were received from the employés of the British Columbia Electric Railway Co. for increased wages and altered working conditions which would increase the present wages bill by approximately 50 per cent. As the demands could not be met, the matter was referred to a Conciliation Board, but the men struck before the award was given. It was finally decided, as a result of a meeting with the Mayor of Vancouver and several leading public bodies, that the employés' demands should be paid, and the right given to the company to charge a 6-cent fare (in place of six tickets for 25 cents) pending further negotiations. The whole of the system has now been re-opened on the basis of a 6-cent fare, with further additional charges in respect of the outlying districts.

Huddersfield.—FARE REVISION.—The Tramways Committee has revised the tramway fares, providing for fares up to 2½d. to be increased by ½d., except those of children and scholars; the 3½d., 4½d., and 5½d. fares to be discontinued, and the remaining fares to be advanced by 1d.; all workmen's fares up to 2½d. to be advanced by ½d., and the workmen's fares of 3d and over to be advanced by 1d. above the new ordinary single fares.

Leeds.—SERVICE REDUCTION.—The tramway department announces that, in spite of the approximate 50 per cent. increase in fares imposed five weeks ago, the latest weekly figures show an increase of 175,000 passengers compared with the same week of 1917, the increase in receipts being £2,575, or about 16·1 per cent. The reason for the increase in fares was the hope that it would bring about a reduction in the number of passengers, and it is now expected that there will be a drastic reduction of the number of cars in operation, so as to meet the wishes of the Coal Controller. A small economy in power has been effected by the abolition of about 25 per cent. of the stopping places, but further economy is essential. It is proposed to reduce the evening services, and to induce large employers of labour to arrange for workpeople to take their meal times at varying times, and so avoid the pressure of traffic at particular moments.

London.—UNDERGROUND RAILWAY ACCIDENT.—Considerable delay was caused in the early part of Friday morning, last week, on the Piccadilly and Brompton Tube Railway by the breaking of an axle of an East-bound train at Piccadilly Circus Station.

Nottingham.—REDUCED SERVICE.—It is proposed to curtail the tramway service on Sundays by not commencing the service until after 2 p.m.

Padiham.—LEASE EXPIRATION.—The town clerk has been instructed to interview the Burnley town clerk with reference to the leasing and working of the tramways after the expiration of the agreement made in 1900, consideration of which has been deferred by the Burnley Tramways Committee.

Scotland.—GOODS TRAFFIC.—The suggestion of the Road Transport Board that tramway cars should be used to carry goods and parcels is being considered by Scottish tramway authorities. The idea is that a saving of horse haulage and petrol can be secured, and tramway authorities have been asked to prepare a return, showing what can be done by day and night.

United States.—NEW YORK.—In the *Electric Railway Journal* of June 1st and the *Railway Gazette* of July 19th there appear illustrated articles dealing with the electrification of the New York Connecting Railway, which forms an important connecting link in the heart of greater New York City between the existing railway lines of the Pennsylvania and New York, and the New Haven and Hartford Railway Companies. The system is used for both passenger and goods-train services, separate tracks being provided for each. Formerly the interchange of a few passenger trains between the two railway systems was effected by a car-ferry route of about 11 miles, from Jersey City to Harlem River, whilst the freight interchange involved the use of a still longer ferry—viz., one of about 13 miles between Greenville and Oak Point. These ferry services were conducted by the New Haven Railway, and the connecting railway which takes their place is worked entirely by the same company. The articles referred to deal with the constructional details of the electrification, and it will be seen that, although the total distance covered is relatively short, the work has been of a heavy character, due to the character of the territory and the traffic conditions which apply in cases of this sort, operating within populated and extensively built-upon areas. In the case of the freight lines the need of a ferry still exists, but the distance is only very short—viz., about three miles. The passenger trains work through tunnels laid under the East River. The electrification has been carried out on the single-phase overhead catenary system, having the same characteristics as those employed on the New Haven Railway. The articles will be found to describe the system in detail.

TELEGRAPH AND TELEPHONE NOTES.

Canadian Telegraphs.—The shortest telegraph strike on record in Canada occurred on Tuesday morning last week, when the telegraph operators of the Great North-Western Telegraph Co. throughout Canada went on strike at 10 o'clock and returned to work at 10.20, owing to the fact that, on the order of the Government, the company met the demands of the employés, which concerned the re-instatement of two men who had been dismissed.

Imperial Cable Rates.—On the motion of Sir Joseph Ward, the Imperial War Conference passed a resolution emphasising the need, in the highest interests of the Empire, for cable rates to be materially reduced.

Japan.—Owing to a breakdown of Chino-Japanese cables, due to a storm, communication with Tokio was interrupted last week.

United States.—President Wilson has issued a Proclamation stating that the taking over by the Government of the telegraph and telephone cables and the wireless systems for the duration of the war will come into effect on July 31st. The authority to operate the wire systems will be vested in the Postmaster-General.

According to the *Telegraph and Telephone Age*, the Western Union Telegraph Co. refused to recognise its employés as members of the Commercial Telegraphers' Union of America, preferring Government control. Correspondence took place between the company and the National War Labour Board, but the former declined to accept a compromise or submit to the jurisdiction of the Board, which consequently published a report upon the circumstances. The company maintained that it could not surrender control of the employés to an outside organisation, and made membership of the Union a condition that entailed discharge from its service.

Wireless Telegraphy on Aeroplanes.—The third annual report of the American National Advisory Committee for Aeronautics, reviewing the work of the Committee during the year ending June 30th, 1917, has just been issued. It is mentioned that the Committee co-operated in the development of a generator for wireless transmission from aeroplanes intended to satisfy the requirements of the Army and Navy. Methods of receiving wireless signals in an aeroplane were also investigated, and it was established at several receiving stations that the sound method was practicable.

CONTRACTS OPEN AND CLOSED.

OPEN.

Australia.—September 4th. Victorian Railway Commissioners. 800 lighting transformers for signal system. A copy of the specification may be seen at the Inquiry Office of the Department of Overseas Trade (Development and Intelligence) in London.

Belfast.—August 16th. Corporation. Two 6,000-KW. turbo-alternators, &c.; one 500-KW. turbo-alternator, &c.; one 30-KW. balancer-booster; four 48,000-lb. per hour water-tube boilers; four fuel economisers, &c.; two steel chimneys, with fans, &c.; two electrically-driven boiler feed pumps, &c.; accumulators; three 500-KW., and five 1,000-KW. rotary converters, with transformers, &c.; two 250-K.V.A., two 350-K.V.A., and six 1,250-K.V.A. transformers. See "Official Notices" to-day.

London.—OFFICE OF WORKS.—July 30th. Carbon-filament tubular lamps. July 31st. Incandescent electric lamps. See "Official Notices" to-day.

Southend.—Corporation. Booster.

CLOSED.

Government Contracts.—List of new contracts placed in June, 1918:—

WAR OFFICE.

Chatterton's compound.—General Electric Co., Ltd.
Air compressors.—Murray Workman & Co., Ltd.
Conveyors.—W. & D. Conveyor Engineering Co., Ltd.
Dynamos.—H. T. Boothroyd, Ltd.; City Electrical Co.; General Electric Co., Ltd.
Ebonite sheet and rod.—Siemens Bros. & Co., Ltd.
Fans, &c.—Davidson & Co., Ltd.
Motors, &c.—British Thomson-Houston Co., Ltd.; Electric Construction Co., Ltd.; General Electric Co., Ltd.; Wright & Wood, Ltd.
Power plant.—Harland Engineering Co.
Switchboards and spares.—British Thomson-Houston Co., Ltd.
Transformers.—Brush Electrical Engineering Co., Ltd.

H.M. OFFICE OF WORKS.

Engineering works.—Generating Set, Fuel Research St., E. Greenwich.—The Vaughan Crane Co., Ltd.; Harrow Electricity Supply; Rotary Converters, Wiring, &c.—North Metropolitan Electric Power Supply Co.; Electric Motors, National Physical Laboratory, Teddington.—Mawdsley, Ltd.; Electric Wiring, National Physical Laboratory.—S. Reed & Sons; Switchboards, National Physical Laboratory.—The New Switchgear Construction Co., Ltd.

POST OFFICE.

Telephone apparatus.—Automatic Telephone Manufacturing Co., Ltd.; Gent & Co., Ltd.; North British Rubber Co., Ltd.; Peel-Conner Telephone Works Co., Ltd.; Western Electric Co., Ltd.
Telegraph and telephone cable.—British Insulated & Helsby Cables, Ltd.; Craigpark Electric Cable Co., Ltd.; Enfield Electric Cable Manufacturing Co., Ltd.; General Electric Co., Ltd.; Hackbridge Cable Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Western Electric Co., Ltd.
Ducts.—Albion Clay Co., Ltd.
Terminal irons.—Walls, Ltd.
Insulator spindles.—Bullers, Ltd.; F. W. Cotterill, Ltd.; Guest, Keen and Nettlefolds, Ltd.
Steel wire.—Whitecross Co. Ltd.

India Office (Stores Department).

Copper wire.—Callender's Cable and Construction Co., Ltd.
Copper plates.—T. Bolton & Sons, Ltd.
Telephone material.—Peel-Conner Telephone Works Co., Ltd.

Barnes.—U.D.C. Coal for the electricity works (2,400 tons of Gedling peas). Kaye, Son & Harper, Ltd., 25s. 3d. per ton.

Birmingham.—Education Committee. Accepted tender:

A. Finney & Co.—Machinery and equipment for the electrical workshop, at the school extension, Ludgate Hill, for the technical training of disabled service men.

Glasgow.—The T.C. Cleansing Committee has accepted the tender of Messrs. Woodward & Co., for the supply of electrical materials for six months.

Some time ago the T.C. Cleansing Department ordered from the Edison Accumulators, Ltd., two 2-ton tipping wagons, and at the last meeting it was reported that information had been received from the firm named that it was improbable that the two chassis (which were being made in America) for the vehicles would, owing to transport difficulties, be delivered this year, and stating that they were prepared, with a view to giving immediate delivery of the wagons, to substitute other chassis therefor, at the same price as those specified in the contract. It was agreed to accept the substitutes.

Tramways Committee:—
Hadfields, Ltd.—Special track work.

Southend.—Corporation. Light Railways Committee. Scott Anderson, electric welding plant, £340.

Swansea.—The B.C. has adopted a report of the Corporation Electricity Committee stating that correspondence had passed with the British Thomson-Houston Co., Ltd., the contractors for the additional turbine plant at the electricity station, regarding the incorporation in the contract deed of a clause, whereby an extra price of £270 would be paid them for 18 standard gauge condenser tubes, owing to 19 standard gauge tubes being unobtainable due to Government instructions. The report recommended that the amount should be paid.

NOTES.

No Minister of Commerce.—Mr. Bonar Law states that it is not the intention of the Government to appoint a Minister of Commerce and a Consultative Committee.—*The Times.*

Volunteer Notes.—London Army Troops Companies, Volunteer Engineers.—Headquarters: Balderton Street, Grosvenor Square, W. 1.

Corps Orders No. 90, by Lieut.-Colonel C. B. Clay, V.D., Commanding.
Captain of the Week.—Capt. E. G. Fleming.
Monday, July 29th.—Adjutant's Technical Lecture ("Earthworks") 6.30—7.30 p.m.
Tuesday, July 30th, to Thursday, August 1st.—Drills as usual.
Friday, August 2nd.—Adjutant's Technical Lecture ("Earthworks"), 6.30—7.30 p.m.
Saturday, August 3rd.—Annual Camp at Esher. Parade, Waterloo Station, 2 o'clock.

C. Higgins, *Capt.* R.E., *Adjutant.*

Starting-Motors for Petrol Motor-Cars.—The Society of Motor Manufacturers and Traders in this country, and the Society of Automotive Engineers in the United States, are considering the question of the standardisation of the details of electric motors for engine-starting purposes on petrol motor-cars. The Committee of the British body which is considering the matter has just decided to recommend 5 in., 5¼ in., and 6¼ in. as the maximum diameters of such motors, and that the teeth on engine fly-wheels and the motor cog-wheels shall be No. 10 diametrical pitch for the 5-in. and No. 8 for the others, the form of the teeth to be involute. The Sub-Committee of the American body having found that present practice in starting motor pinions varies from 9 up to 13 teeth, has reported that as long as this variation exists it is impossible for engine designers to maintain gear centres and provide for complete interchangeability of starting motors of different makes. It is considered that an 11-tooth pinion would serve practically all purposes, and, in view of this, it has recommended that fly-wheel starting motors shall be equipped with an 8 to 10 pitch, 11-tooth pinion wherever possible.

Census of Railway Wagons.—Under an order of the Board of Trade, dated July 25th, 1918, any person in possession of railway wagons not owned by a railway company on August 1st, must make a return to the Board stating the sizes and number of the wagons. Application for the form of return should be made to the Board of Trade, Statistical Department, 68, Victoria Street, S.W. 1.

A Trench Truncheon Torch.—This electrical torch is made on quite a novel system, and takes the place of a weapon for the man provided with it. According to the inventor, Mr. C. S. Northcote, it is guaranteed against all defects electrically for 12 months, will give 30 hours' continuous light, and can be used as a flash-lamp for three months. By a patented system of filling, 50 are put into a rack at once, and can be charged in one hour.

Charges for Public Services.—On Monday the Statutory Undertakings (Temporary Increase of Charges) Bill was considered in Committee of the House of Commons. An amendment to enable the undertakers to raise the charges sufficiently to allow of the payment of the pre-war rate of dividend was opposed by the Government, but Sir Arthur Stanley left it to the Committee to decide whether the rate might be two-thirds or three-quarters of the pre-war rate, and in the end an amendment substituting "three-quarters" for "one-half" was carried by a large majority.

In our last issue we pointed out the inequity of the proposal of the Board of Trade, and it may be of interest to describe the simple and unobjectionable system which has been adopted in France since the outbreak of war. This system is based upon the price of coal, and is, therefore, analogous to the contracts which are in force in connection with many of our own undertakings. The supply authorities are allowed to charge for electrical energy at the pre-war price plus 0·2 centime per franc of increase in the price of coal above the pre-war price. On this basis it is tacitly assumed that the consumption of fuel is about 2 kg. per KW.-hour; but in the case of small and uneconomical stations the addition of 0·3 centime per franc may be authorised, while large modern undertakings are allowed an addition of only 0·15 centime. In many places the cost of coal is based upon the contract prices paid by the French State Railways. The price to be charged during the coming quarter is often fixed in accordance with the actual cost of coal during the current quarter. No difficulty is experienced in carrying out this system, which is perfectly fair to all parties.

Engineers' Protective Associations.—At the invitation of the Council of the Institution of Electrical Engineers, a Conference of representatives of the Associated Municipal Electrical Engineers of Greater London, the Chief Technical Assistants' Association, and the Electrical Power Engineers' Association was held at the temporary offices of the Institution, on the 9th inst. The number of representatives sent by each Association was in proportion to its membership.

The chair was taken by Mr. C. H. Wordingham, C.B.E., president of the Institution, and the Council was further represented by Messrs. R. A. Chattock, G. W. Partridge, and Roger T. Smith, vice-presidents; and Messrs. A. H. Marshall, R. Howard Fletcher, and W. Lang, chairmen of the Newcastle, Western, and Yorkshire Local Sections respectively.

At the close of the proceedings the following resolutions were passed, subject to ratification by the governing bodies of the three Associations:—

1. That one single combined protective Association be formed for the whole electric supply industry.

2. That chief engineers be included in the membership, provided they are not employers or employers' representatives on an Industrial Council or similar body dealing with technical staffs, subject also to proper safeguards for special staff questions that may arise.

3. That a protective Association formed from existing Associations adopt the constitution, and, for the present, the title, of the Electrical Power Engineers' Association, seeing that it is the only existing Association for the purposes in view which is constituted as a Trade Union.

4. That the qualifications for membership of the Association be those of the Electrical Power Engineers' Association, but all new members elected after December 31st, 1921, shall be required to have passed the A.M.I.E.E. examination or an equivalent examination, and that this be the link between the Institution and the Association.

5. That the Chief Technical Assistants' Association and the Associated Municipal Electrical Engineers of Greater London each appoint two representatives to meet the National Executive Committee of the E.P.E.A. at Manchester, on July 27th, to discuss and approve the draft constitution of the E.P.E.A. This draft in turn to be submitted to the Institution for final ratification. The representatives of the two Associations first named, if members of the E.P.E.A., to remain as part of the National Executive Committee of the E.P.E.A. for the current year (*i.e.*, until June, 1919).

The Institution also to send a representative of the Council to attend the meeting of July 27th in an advisory capacity.

Electrical Power Engineers' Association.—A meeting of the Divisional Council of the London Division was held at St. Bride's Institute, on Friday last. The report of the Conference between the I.E.E., A.M.E.E., C.T.A.A., and E.P.E.A. was under discussion. Exception was taken to Clause 5 of the report, and after discussion the following amendment was unanimously agreed upon:—

5. Provided that the C.T.A.A. and the A.M.E.E. agree to the previous resolutions, these Associations may appoint two representatives—who shall be members of the E.P.E.A.—to attend the meeting of the National Executive Council of the E.P.E.A. at Manchester, on July 27th, to discuss and approve the draft constitution of the E.P.E.A. This draft, in turn, to be submitted to the I.E.E. The representatives of the two Associations first named to remain as part of the National Executive Council of the E.P.E.A. for the current year.

Royal Visit to a Power Station.—The King and Queen visited the London and South-Western Railway Co.'s power station on Saturday afternoon last.

Educational.—Municipal College of Technology, Manchester.—We have received the Prospectus of the 1918-19 session, containing particulars of the University Engineering courses. Prof. Miles Walker is the head of the electrical engineering department.

Electric Power Supply in War-Time.—The annual report of the Chief Inspector of Factories and Workshops contains the following extract from a short report by Mr. G. Scott Ram, electrical inspector:—

The use of electrical energy has enormously increased during the war, and it may be safely stated that the marvellous output attained by munition works of all kinds would have been impossible but for the augmented public supply of electrical energy in the manufacturing districts. The increase is not only for power purposes but for other uses as in electro-chemical processes, steel making, welding, &c. The demand on the power houses has been such that, in many cases, it has been impossible to lay off the plant for overhaul or cleaning at the proper times, and shortage of staff has led to longer shifts having to be worked. Manufacturers of steam and electrical generating plant and switchboards have been very busy in supplying additional machinery to meet the requirements of the supply undertakings, and manufacturers of motors and accessories for use in the works have been equally pushed. In some districts, large applications for power supply are held up pending delivery of plant.

In general it may be stated that the new installations particularly at the larger munitions works have been of a satisfactory nature, the work being well done and in accordance with the Factory Act requirements, although certain exceptions to this rule have been met with. At many works difficulty has been experienced in obtaining competent electrical engineers to supervise extensions or to look after the plant in operation, and several of the accidents occurring during the year appear to have been due to the employment of persons having inadequate training or experience.

A new feature, due to the shortage of male labour, owing to the war, is the employment of women in electrical stations. In generating stations women are employed as general cleaners, including the cleaning of standing machinery. Others of a better educated class are employed as assistants on the switchboards, working under supervision. In a few sub-stations they are employed on still more responsible work, being in sole charge of the operation of the plant, including the running of motor generators or rotary converters, with the accompanying switching and regulating duties. For such work the women have to be very carefully selected and have to undergo a period of training under supervision before being put in charge. The sub-stations selected have also to be suitable as regards the type and protection of the plant and the duties of the women limited to the routine working of the same. In general, however, the work of sub-station attendants is, for obvious reasons, more suitable for men, and schemes are in operation for the training of disabled sailors and soldiers for this work. A number are, in fact, already so employed. This work appears to offer very suitable employment for such men where their form of disablement permits, and opens up a useful field for their permanent occupation, but of course for a very limited number.

Electric Vehicle Progress.—According to the Electric Vehicle Section of the N.E.L.A., U.S.A., arrangements have been completed for the installation of electric battery chairs at the New York Zoological Park. These chairs will operate at a speed of 3½ miles per hour, and are capable of travelling twenty miles on one battery charge. Each chair will accommodate two, or if of slight build, three persons, and they are simple in construction and operation so that anyone may, with absolute safety, drive at will through pedestrian traffic. The cars are equipped with a safety guard which, if it come in contact with any obstruction, will apply emergency brakes, causing the car to stop promptly without injury to object or car. The vehicles are also fitted with a positive governing device which controls the speed on down grades. These electric chairs are similar in design to those successfully employed at the San Francisco and San Diago Expositions.

Electric vehicles are being used extensively in hauling mail and parcel post matter and also in the Navy yards and arsenals of the Government in Washington, at Panama, and by the Bureau of Insular Affairs in Manila. The electric truck is given preference on the score of economy and ease in handling by incompetent drivers. Also the freedom from fire risk is much in their favour in the Navy yards and arsenals, where inflammable stores and ammunition, &c., are handled.

Ice after being stored and cut (natural ice), or made, must be delivered at considerable cost. It was found that nearly one-half of each dollar paid by the consumer went for transport. American ice dealers are installing electric vehicles in increasingly large numbers, as they have proved to be the most economic means of city transportation. A Philadelphia manufacturer has developed a special type of electric truck for meeting conditons that cannot be economically handled with the ordinary 5-ton equipment. The special truck is arranged to drive on the front wheels only, the large rear wheels being steel tired; the speed is lower and the battery smaller, resulting in a materially reduced first cost, and a reduction in amortisation and interest. Maintenance is also greatly reduced, resulting in a total cost lower than the cost of doing the same work with the horse equipment.

Electric trucks are also successfully being employed in coal deliveries; coal dealers are rapidly discarding inefficient motive power and turning to electric vehicles to relieve their delivery problems. An interesting comparison of the performance of an electric truck and two gasoline trucks operated in Boston, follows: Three trucks were employed on a contract for coal delivery. The round trip from the loading platform was 3.7 miles, conditions of loading and unloading were exactly the same, and the time constituted a full day's performance for each truck. The electric was a 6-ton unit, while the gas trucks were 5-ton, and 4.5-ton respectively. The 5-ton gas truck delivered 49 tons of coal in 12 trips; the 4.5-ton gas truck 40 tons in 13 trips, and the 6-ton electric 86 tons in 13 trips. The actual running time of the electric truck was from 7.12 in the morning until 4.40 in the afternoon with one half-hour out for lunch. It will be noticed that the electric was consistently overloaded, while both gas trucks were underloaded. The battery of the electric truck was boosted once during this period. The two gas trucks hauled practically the same amount of coal during the day that was hauled by one electric truck. That this was not a freak performance of the electric is evidenced by the fact that the next day the electric carried 12 loads of 78 tons, and the following day 12 loads of 76 tons, making a total of 240 tons in three nine-hour days. This same electric, a few days later, on shorter hauls, delivered 123.5 tons of coal in 19 loads, leaving with the first load at 7.12 a.m. and finishing at the garage at 5.05 p.m. with about three-quarters of an hour rest at noon. The loading time was six minutes per load, and the actual miles covered were 26.5. The company operating these trucks estimates that its per diem cost on the gasoline trucks is from 50 to 70 per cent. greater than it is on an electric.

The Wandsworth National Kitchen.—On Thursday last week the Food Committee of the Council opened the national kitchen and restaurant installed at the public baths, Wandsworth. Guided by the experience of other London boroughs, electricity has been adopted for all cooking purposes, except those for which the existing steam supply could be successfully employed. Provision is made for supplying between 1,500 and 2,500 daily, and there is seating accommodation for 200 people. The prices charged are about the same as those ruling at other national kitchens, and food can be eaten on the premises or taken away in vessels brought by customers. The Brompton & Kensington Accessories Co., Ltd., installed the electrical equipment, which comprises two fish fryers, four boiling plates, and two "F" type roasting and baking ovens, a five-tier electric steamer being on order. The ovens are of substantial cast-iron construction; they are finished black, the mouldings of the doors being polished bright. Each oven has a cooking space measuring 2 ft. 4 in. by 2 ft. 7 in. by 2 ft., giving a capacity of 12 cu. ft., and is fitted with three grid shelves, meat hook, and a drawer underneath to catch the fat. The ovens are heavily lagged on all sides; standard B. and K. elements are fitted at back and sides, the loading being at full heat 7.2 KW. Heat control is effected at a switch panel mounted above the oven; two rotary three-heat switches, double-pole fuses, and pilot lamps are provided.

The four boiling plates are each fitted with a 6-in. open-type ring mounted flush with the surface of a polished cast iron plate measuring 18 in. by 11 in., each ring being loaded to a maximum of 1.2 KW., and arranged for three-heat control from a switch panel fixed on the wall behind, fitted with a pilot lamp, d.p. fuse, and rotary switch. The Jackson fish fryers consist of oval cast-iron pans, 18 in. by 12 in. by 10 in. deep, with elements bolted to the base, and controlled from the wall behind. Each pan is loaded to 2.5 KW.

The five-tier steamer which is on order will be loaded to 4 KW., and will be used for steaming vegetables, puddings, &c.; it will cook 200 lb. of potatoes in 35 minutes, a ham being boiled in the water vessel at the same time.

The electrical equipment will have a connected load of 28.2 KW. when the steamer has been installed. The cookers are balanced across the three-wire A.C. system, the pressure between outers and neutral being 205 volts. All baking, roasting, fish frying and boiling will be done electrically, and much of the duty at present carried out by steam will be performed by the B. and K. steamer when it has been delivered.

A Super-station for the Midlands.—In view of the Government's national scheme for the better utilisation of the coal resources of the country, the Nottingham City Council recently appointed a committee to deal with the bearing of the matter upon the East Midlands district, of which Nottingham is the centre, and to consider the possibility of the establishment therein of one of the great electrical power stations which it is proposed to set up in various parts of the country. This report, involving considerations of a far-reaching character, has been prepared, and came up for consideration at a special meeting of the Council last week. The committee recommended that in view of the natural advantages possessed by the city, steps should be taken to secure the establishment in the district of one of the new large electrical power stations. Four sites regarded as possessing in a peculiar degree the advantages necessary for the purpose were brought under consideration, these being situated within close proximity to the city—one near Clifton Colliery, Milford; another half a mile below Trent Bridge; the third a mile below the weir at Colwick, and the other near Colwick sidings. It was suggested that a radius of supply extending over 40 miles might be economically dealt with under

the scheme, this including within its scope Sheffield, Chesterfield, Mansfield, Newark, Retford, Lincoln, Loughborough, Leicester, Kettering, Burton-on-Trent, Derby and Ilkeston. The report pointed out that Nottingham district had the essential factors required for so large a station as the one proposed, these including an ample water supply, proximity of collieries, suitability of communications, and large industries requiring electric power. With regard to the method of working, it was suggested that the most economical plan would be to convert the coal into gas and recover the ammonium sulphate, using the gas to produce electrical power. The fuel proposed to be used is Top Hard Slack and "Jacks," both inferior fuels which in normal times are unsaleable, and of which a large proportion is left in the mines, the scheme being thus designed to convert into national wealth what has hitherto been a national loss. The recovery of by-products, as to which the report embodied elaborate figures, was regarded by the committee as one of the important elements in the scheme.

As an outcome of the meeting of the Corporation, the special committee was reconstituted upon a larger basis, and power was given to engage expert advice in preparing a scheme, it being suggested that in all that was done the committee having charge of the city electricity undertaking should be consulted. Mr. R. H. Swain, chairman of the Electricity Committee, urged that the proposed area of supply, embracing territory within a radius of 40 miles of Nottingham, was much too extensive, and that it ought not on any account to exceed 25 miles. He added that it was never intended that Sheffield, which would have a scheme of its own, should be included. Mr. Atkey, the chairman of the committee, whose report was adopted, explained that as large rings were being drawn upon the map by other public bodies to indicate the possible sphere of their activities, Nottingham had acted similarly. He emphasised the importance of the scheme from, among other points of view, the possibility which it would afford of producing motor spirit, for which hitherto they had been too much dependent upon foreign supplies. A great national purpose would, he urged, be served by effectively handling the national question of electricity supply from large power stations, and it was intended that Nottingham, situated in the midst of a rich coalfield, should not be left behind in the matter. Sir Arthur Duckham had told them that the Government was more likely to yield to the wishes of those public authorities which had themselves shown the initiative by taking action than to give precedence to those which had done nothing. An amendment was proposed, but was not seconded, limiting the powers of the committee to those of an advisory character, without executive functions, Mr. Atkey pointing out that there was no reason to fear that in any action that was taken the committee would run counter to the general wishes of the Council. Major Walker, managing director of the Clifton Collieries, one of the chief undertakings in the neighbourhood of Nottingham, contended that the time was ripe for action, and that if the Council did not do what was necessary, somebody else might step in. The committee by the vote of the Council was empowered to take all requisite steps.

Advantages of High Pressure and High Superheat in Steam-plant Operation.—The advantages of high pressure and superheat as affecting steam-plant efficiency, by Eskil Berg, and condensers, by D. W. R. Morgan, were the topics of papers presented before a joint meeting of the A.I.E.E., the Western Society of Engineers and the American Society of Mechanical Engineers at Chicago on June 17th.

Mr. Berg strongly favoured the adoption of higher pressures and higher temperatures than are now considered standard in this country in order to improve plant efficiency. He especially favoured higher pressure. His paper was replete with data showing the possible saving in fuel which could be made by such means. As indicative of the character of these data, Mr. Berg presented a table showing that a plant operating with 800 lb. boiler pressure and 800 deg. superheat containing turbines 85 per cent. efficient and boilers 88 per cent. efficient, could produce 1 KW.-hour on 11,750 B.T.U.

Answering a question on the cost of high-temperature and high-pressure equipment, Mr. Berg expressed the opinion that after development charges had been eliminated this equipment would be cheaper than now produced for standard pressures and temperatures.

Mr. Morgan described the improvements in condenser building which had been made by the Westinghouse company. He also predicted that the war would probably make it necessary for central stations to use more jet condensers and to use steel tubes or tubes of other than bronze metal in surface condensers in order to conserve for actual war uses metals more sorely needed.

Mr. Morgan, in his closing remarks, urged attempts to go from 28 in. to 29 in. (71 cm. to 73 cm.) of vacuum, thus effecting a saving of 4 per cent.

The Future of the Electric Pump in Lybia.—The system used by the Arabs to draw water from the wells is centuries old; hence it is not surprising that the installation of the first electric pumping plant met with an extraordinary success. Unluckily, to the first triumph succeded a bitter illusion, which has considerably discouraged the natives. In the first place, the local electrical company had not prepared for a great call, and its stock was soon exhausted; in the second place, and most important of all, the lines and transformers and network were not suited to the local conditions, and especially the atmosphere. Hence resulted an ineffective service, which disgusted new users. Furthermore, the electric pumps were not set up in accordance with any rational technical method, and were left to be worked without any supervision, and the consequent accidents made a disastrous impression. Nevertheless, these plants have a great future before them in Lybia on condition that makers do not limit their operations to merely supplying the plants to local agents, but themselves direct the installations and supervise their working until such time as the users have become masters of their new acquisitions.—*Elettrotecnica.*

Foreign Trade.—The June Figures.—The official returns of imports and exports during last month contain the following electrical and machinery figures:—

	June, 1918.	*Inc. or dec.*	*6 months*, 1918. *Inc. or dec.*
Imports.			
Electrical goods ...	115,822	+ 31,550	— 194,242
Machinery	1,139,833	+471,790	+ 1,581,407
Exports.			
Electrical goods ...	151,994	— 92,303	— 572,420
Machinery	1,571,980	— 46,144	— 1,961,026

The County of London Royal Engineer Volunteers (London Army Troops Companies).—This Corps arose out of the amalgamation of three Volunteer organisations—those of the Engineering Institutions, the Architects, and the staff of the L.C.C.—and its doings have been regularly chronicled in our columns. Important duties have been assigned to the Corps, and recruits are urgently required to enable them to be effectively carried out. Its work is of a character particularly interesting to

engineers, who, moreover, would find themselves in the congenial company of brother engineers, and would enjoy the annual camps, during which pontooning, bridging, obstacles, demolitions, &c., form part of the exercises undertaken. An Illustrated brochure has been issued giving details regarding the Corps and its work, and can be obtained from the Adjutant, Headquarters, Balderton Street, W. 1. We reproduce herewith in miniature a poster which suggestively invites recruits to join up.

Appointments Vacant.—Fitter for the Urban Electric Supply Co.; electrical mechanic for gas works plant for the Warrington Corporation; resident electrical engineer for Ebbw Vale U.D.C. at £250; assistant electrical engineer for the Welsh Metropolitan War Hospital, Whitchurch, near Cardiff; assistant mains engineer for the Calcutta Electric Supply Corporation, Ltd.; shift engineer (£2 10s. + £1 8s. 9d) for the Oldham Corporation; electrical artificers (2s. 6d. + 1s. 8d. per day) for the Royal Marine Submarine Miners; shift engineer for the Rawtenstall Corporation; electrical draughtsman for the Admiralty; shift engineer (£3 5s. + 12½ per cent.) for Radcliffe U.D.C. See our advertisement pages to-day.

Imperial Preference.—In a speech delivered on Wednesday at the West India Club, in London, Mr. Walter Long, Secretary of State for the Colonies, said that the Committee of the Cabinet which had considered the question of trade within the Empire after the war had decided in favour of Preferential trade within the Empire, and the Cabinet had given approval to the scheme.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station and Tramway Officials.—The South Lancashire Tramways Co. has appointed MR. WM. R. ANDERSON, cable and sub-station superintendent, to the position of resident engineer, and MR. A. WILLIAMS, charge engineer, to that of cable and sub-station superintendent.

The Lincoln T.C. has decided to increase the salary of MR. STANLEY CLEGG, electrical engineer and tramway manager, by £250 a year from August 1st.

The Barnsley T.C. has appointed MR. E. C. LAZENBY as shift engineer at the electricity works at £156 a year, plus 12½ per cent. war bonus.

The Barnsley T.C. has resolved that CAPT. BARKER act as consulting engineer at the electricity works for the remainder of the war at a salary of £225 a year.

The Brighton Lighting Committee recommends that the salary of the engineer and manager, MR. J. CHRISTIE, be increased by £100 as from January last. It states that Mr. Christie, whose salary is £1,000 a year, is debarred from participating in the scheme of war bonus granted to every other member of the staff, under the awards of Sir George Askwith and the Committee on Production.

MR. R. S. PILCHER, tramway manager at Aberdeen, is recommended for the appointment of tramway manager under the Edinburgh Corporation, at £1,000 per annum.

General.—The Officers, N.C.O.'s, and men of the Warwickshire R.E. (Volunteers) have recognised the services rendered to them by CAPT. S. T. PEMBERTON, who acted as Adjutant for nearly three years, by presenting him with a handsome silver centre piece and side dishes on July 20th. The presentation was made at a full muster of officers and men by the Commanding Officer (Major D. Shanks), who referred to the ungrudging efforts made by Capt. Pemberton to maintain the membership and efficiency of the Corps during the time he acted as Adjutant. Capt. Pemberton was one of the first to join the Volunteers shortly after war broke out, and has been associated with the Engineers ever since. He retains his position as Captain of the Signal Company, and the Corps will continue to have the benefit of his experience. Mr. R. A. Chattock (Hon. Colonel) testified to the good work done by Capt. Pemberton, and appreciative remarks were made by Capt. Jenkins, Lieut. G. O. Donovan, Lieut. Marples, and Lieut. Varnom, who have all been associated with him since the Corps was raised.

In consequence of extra services, an additional payment of £130 has been made to MR. W. BREW, head of the electrical engineering department of the Municipal Technical School, Birmingham. MR. H. SPOONER has been engaged as workshop teacher for the Electrical Engineering Classes for Disabled Soldiers, at a salary of £156 per annum, plus £52 war allowance.

MR. REGINALD GRIFFIN, electrical engineer, who was responsible for the introduction of public electric lighting in Monasterevan, Co. Kildare, has been appointed district engineer to the Board of Trade Coal Mines Department.

Roll of Honour.—CAPTAIN A. E. GORE, N. Staffs Regiment, formerly a draughtsman at the Dynamo Works of Siemens Bros., Stafford, has been mentioned in French Army Orders for bravery in action on June 6th.

SERGEANT F. G. GORING A.S.C. (M.T.), who was partner with Mr. Bruce Collier in the Electric and General Lighting Co., Farnham (Surrey), has been awarded the Meritorious Service Medal.

PRIVATE J. H. JOHNSON, who has died suddenly at Salonika, was chief assistant engineer of the Merthyr Tydfil Electric Traction and Lighting Co., Ltd.

PRIVATE W. SILCOCK, Duke of Wellington's Regiment, who has died after discharge owing to wounds, was at the Chesterfield Corporation electricity works.

SECOND-LIEUT. B. M. BADCOCK, Sherwood Foresters, who has fallen in action, was in the electrical engineering department of the Staveley Coal and Iron Co., Ltd., of Chesterfield.

PRIVATE J. T. PRICE, of the Aberystwyth E.L. works staff, is a prisoner of war at Limburg.

WIRELESS OPERATOR CECIL F. NEWBERY, of the Marconi School, London, has lost his life on his first voyage.

WIRELESS OPERATOR C. E. MATHER has been awarded the Distinguished Service Medal for services rendered on a mine-sweeper mined last November.

PRIVATE WM. HULME, Lancs. Fusiliers, who has died of wounds, was in civil life engaged in the electrical department of the Wigan Coal and Iron Co.

PRIVATE W. A. CHAPMAN, Welsh Regiment, who has been commended for distinguished conduct in the field, was employed by Messrs. Dick, Kerr & Co., Ltd., Preston.

PRIVATE A. J. MCQUAID, Manchester Regiment, who is a prisoner of war in Germany, was employed at the Wigan Corporation electricity works.

SERGEANT W. W. HUGHES, who, previous to enlisting in August, 1914, was on the telegraph staff of the Leeds General Post Office, has been awarded the Meritorious Service Medal for services rendered with the R.E. Wireless Signals Section.

MAJOR H. C. THOMAS, who in civil life was an electrical engineer in London, has been gazetted lieutenant-colonel. Colonel Thomas, who is 28 years of age, has seen three years' service at the Front, and is an Assistant Director of Signalling at the Horse Guards.

Obituary.—The death is announced from Berlin, at the age of 65 years, of HERR ARNOLD VON SIEMENS, eldest son of the late Werner von Siemens; the deceased was a director of the Siemens & Halske Co. and of the Siemens-Schuckertwerke.

We regret to announce the death of MR. T. HAYES, resident engineer of the South Lancashire Tramways Co. Mr. Hayes, who was only 40 years of age, had been connected with the company for the past 14 years.

The death occurred suddenly, on July 17th, at Birmingham, of MR. F. W. V. MITCHELL, in his 77th year. He was one of the original directors of the Birmingham Electric Supply Co., whose undertaking was taken over by the Corporation.

NEW COMPANIES REGISTERED.

Engineering Proprietary, Ltd. (150,985).—Private company. Registered July 17th. Capital, £100 in £1 shares. Manufacturers of aircraft and component parts thereof, manufacturers of electrical appliances and material, electrical and general engineers, &c. The subscribers (each with one share) are:—C. Nathan, Clanricarde Gardens, S.W., secretary; E. R. White, 29, Malvern Road, Thornton Heath, secretary. The first directors are to be appointed by the subscribers. Registered office: 97, New Bond Street, W.1.

Non-Conductors, Ltd. (151,000).—Private company. Registered July 19th. Capital, £300 in £1 shares. To acquire from W. Sumner and G. F. Dagnall the benefit of certain inventions relating to non-conducting substances and compositions, &c., and to carry on the business of manufacturers of mineral, rubber, asphalte, compounds for use in refrigerating chambers or cold stores, insulating compositions, packings, &c. The subscribers (each with one share) are:—A. Lawson, 27, Stalbridge Avenue, Liverpool, cashier; J. B. Kenny, 35, Wellington Avenue, Liverpool, accountant's clerk. The first directors are to be appointed by the subscribers. Solicitor: H. T. Smith, 6, Newington, Liverpool.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Aluminium Corporation, Ltd.—Two mortgages dated June 26th, 1918, to secure £300 and £1,000 respectively, charged on farms in Llanrhychwyn, Carnarvon. Holders: (a) Misses M. and E. Davies, (b) R. S. Chamberlain and Miss L. G. Chamberlain.

CITY NOTES.

Great Northern Telegraph Co., Ltd., of Denmark.

At the meeting held on June 29th at Copenhagen, Consul-General W. WEIMANN said that the difficulties of European cable maintenance were felt more intensively now than at any previous time, with the result that several of the company's most important European cables were useless for the present. The cable steamer "H. C. Orsted" had been occupied for 161 days. The two cable steamers in the Far East, the "Store Nordiske" and the "Pacific," had been occupied for 250 days, 128 of which were for the account of other administrations. Owing to the circumstances prevailing in Russia, the Wladiwostock and Kiachta routes had taken only a very small share in the transmission of the traffic between Europe and the Far East. They had tried to remedy the interruptions mentioned above by appropriating the remaining cables in the most advantageous way to the use of the several countries served by the lines. After the fire in their building at Shanghai they took steps to provide for suitable fireproof premises for station and offices. The building was expected to be completed by the end of 1920, when the lease of the present building expires. In the new building they would be able to accommodate the telegraph stations and offices of the Eastern Extension, Australasia and China Co. and the Commercial Pacific Co., besides other tenants. The cable depot at Tuborg will be adandoned, and a new cable depot will be built on a leased plot of ground within the Free Harbour of Copenhagen, the harbour of Tuborg being too shallow for the new cable steamer which it has become necessary to build, as soon as circumstances permit, to replace the "H. C. Orsted." The Government of Iceland obtained from the company a loan of £27,500 for developing the Icelandic telegraph and telephone systems. The difficulties of the food supply have made themselves felt in nearly all the countries in which the staff is employed. The company has tried to remedy these difficulties by granting liberal extra allowances and, whenever necessary, by sending supplies of provisions from Denmark. This specially applies to Petrograd, where the company continues to keep a rather large staff in order to be able to resume the instrument service itself at the shortest notice, as soon as the necessary permission has been given by the Russian authorities. A year ago he said that they had to be prepared for a considerable decrease of the net receipts, at all events after the conclusion of peace. The decrease had already commenced, and the net result of the year's working was about £157,400 lower than that of the preceding year. The cause of this considerable decline was to be found, partly in the great loss on exchange, partly in the heavy increase of the expenses. While the rates of exchange might approach the par rates within a reasonable space of time after peace, even with the exercise of strict economy the expenses were likely to continue abnormally high for a long time to come. The result

of the year's working had, however, been so satisfactory that they proposed a total dividend and bonus of £22 per cent. (only 2 per cent. less than last year). Nobody could cast the horoscope of the company at the present moment. A considerable change had taken place in regard to the traffic transmitted by the company, the important telegraphic correspondence with Russia having been reduced to a minimum, owing to the revolution, the possible effects of which on their future position could not as yet be foretold. On the other hand, the traffic in the Far East had continued to develop satisfactorily.

Singapore Electric Tramways, Ltd.

Sir Frank A. Swettenham presided at the ordinary general meeting, held on July 16th. The profit for the year was £4,274, compared with £9,913 for the preceding year, and subject, as usual, to the royalty payable to the Municipality Commissioners in Singapore. Traffic receipts were £1,140 better than the previous year, and the sale of electric energy also increased by £1,080. Costs in all directions had increased, especially the cost of coal; energy generated by steam cost about 3¼ times more than when generated by Diesel plant. Endeavours had been made to induce the Municipal Commissioners to modify the terms of the contract for the supply of energy, but without success. There was a profit on the sale of energy in 1917, but towards the end of the year they were making a loss, and the loss would be severely felt during the current year unless the Commissioners could be induced to pay a fair price for energy. The expenses of the whole undertaking represented 65.9 per cent. of the total receipts, while Singapore expenses were 65.1 per cent. of Singapore revenue. These figures compared with 59 per cent. and 57.8 per cent. for 1916. An interim dividend of 5 per cent. was paid on July 3rd, and it was decided not to distribute any further profits at present.

German Companies.

The A.G. fur Elektrotechnische Unternehmungen, of Munich, reports net profits for 1917 which allow of the payment of the arrears of interest on the preference shares for 1916.

The Elektro-Salpeter Werke A.G., of Zschornewitz, which obtains power from the Electrowerke (Bitterfeld lignite), reports a loss of £23,000 in 1917, after having allocated £43,000 to depreciation, as against £4,700 in 1916. As a consequence the deficiency becomes increased to £65,000 on a share capital of £150,000.

The Elektra A.G., of Dresden, which owns supply works, and is also interested in others, reports that most of the undertakings yielded unsatisfactory results in 1917-18. After making provision for depreciation, the accounts reveal a loss of £2,200, as compared with a loss of £6,000 in the previous 12 months, which has been covered out of the reserve fund.

The directors of the *C. Lorenz A.G., of Berlin*, state that the profits realised in 1917 did not correspond with the considerably greater turnover, and the constantly growing expenses were accompanied by partly unprofitable sale prices. The net profits amounted to £100,000, as against £110,000 in 1916, and the dividend is 35 per cent. on the share capital of £225,000, being the same as in the previous year.

The Elektrizitats A.G. vorm. W. Lahmeyer & Co., of Frankfort-on-Main, which continues a purely investment company, reports a considerable expansion in the supply business of the lighting and power undertakings and in the tramway traffic on the one hand, and a large increase in the working expenses on the other. As net profits the accounts indicate the sum of £134,000, as against £130,000 in 1916, and the dividend is 8 per cent. on share capital of £1,500,000, as in the preceding year.

The Deutsch-Niederlandische Telegraphen Gesellschaft, of Cologne, reporting on the year 1917, states that only scanty news was received from the Far East, from which it was concluded that no material alterations had taken place in the conditions of the stations and cables since 1916. The net profits and balance forward are returned at £26,000, as compared with £25,000, and a dividend of 6 per cent. on the ordinary share capital of £350,000 is proposed, being the same rate as in the preceding year.

The Electro Treuhand A.G., of Berlin, which was originally formed by the Siemens & Halske Co. and the Siemens-Schuckert Works for the financing of undertakings projected jointly by these companies, and which holds a large block of shares in the Hamburg Elevated Railway, reports net profits of £34,000 for 1917, as against £31,000 in the previous year. A dividend at the rate of 5½ per cent. is recommended on the paid-up share capital, as was also paid in 1916.

The Deutsch-Atlantische Telegraphen Gesellschaft, of Cologne, reports a loss of £21,000 for 1917, as contrasted with losses of £25,000 and £42,000 in the two preceding years respectively. By transferring, however, £65,000 from the special reserve fund, as against £75,000 and £100,000 in the two previous years respectively, it has been possible, as already reported, to declare a dividend of 3½ per cent. on the ordinary share capital of £1,200,000, as compared with 4 per cent. in 1916 and 6 per cent. in 1915.

The Continentale Gesellschaft fur Elektrische Unternehmungen, of Nuremberg, which acts as a financing undertaking for the Schuckert group, reports a slight improvement in the results as compared with the previous year in consequence of the raising of fares and prices in connection with the tramways and lighting stations. As net profits the accounts show a total of £52,000, as against £44,000 in 1916, and the dividend is 3 per cent. on capital of £1,556,000, this contrasting with 2½ per cent. in each of the two preceding years.

The directors of the *Akkumulatoren Fabrik A.G., of Berlin and Hagen*, reporting on the past year, state that the turnover was considerably greater than in 1916. It was possible for the company advantageously to dispose of its share in the Oerlikon Accumulator Co., but no reliable information was obtained concerning its undertakings in hostile countries. After allocating £6,000 to depreciation, as against £3,000 in 1916, the accounts indicate net profits of £176,000, as compared with £193,000, and it is proposed to pay a dividend of 25 per cent. on share capital of £600,000, as was also the case in 1916.

The Deutsch-Sudamerikanische Telegraphen Gesellschaft, of Cologne, states that the company's property at Monrovia was placed under the supervision of the Liberian Government before the departure of the staff to France, and the buildings at Pernambuco were damaged by fire during excesses of the mob. There was no question of any dividend from the Compania Telegrafico-Telefonica del Plata, of Buenos Aires, for 1916 and 1917, and a further sum of £14,000 had been written off the company's investment in the Buenos Aires Co. The accounts of the Cologne Co. exhibit net profits of £34,000 for 1917, as compared with £54,000 in the previous year, and the dividend of 5 per cent., as recently reported, is the same as in 1916.

The report of the *Felten & Guilleaume Carlswerk A.G., of Cologne-Mulheim*, is very brief, and merely states that nearly all departments contributed towards the considerable increase in the turnover in 1917, and corresponding profits were yielded by the subsidiary companies and investments. After setting aside £243,000 for depreciation, as contrasted with £156,000 in 1916, the accounts show net profits of £519,000, as against £415,000, permitting of the payment of a dividend of 15 per cent. on the share capital of £3,000,000, as compared with 12 per cent. in 1916. The report mentions that the company's interest in the Steinfort Iron & Steel Works Co. had been augmented as a result of the latter's expansion of capital, and that an investment had been made in a lignite mine so as to ensure the supply of fuel to the Carls Works.

Chile Telephone Co., Ltd.—Mr. C. W. Parish, speaking at the annual meeting, said that there were signs on every hand in Chile of general confidence and prosperity. They had studied the developments of their territory so as to be prepared with plans for meeting increased telephonic needs, and for acquiring some small businesses bordering on that territory. They were laying some important underground lines in place of the old overhead wires, and they were adopting modern switching apparatus in place of the former magneto system. They had in view the introduction of the automatic system. If the Chilean Government would grant them the necessary tenure which would justify such a large expenditure, they were inclined to erect in Valparaiso a full automatic plant which would place that city in the first rank telephonically, and they would doubtless eventually adopt this policy in other important towns. The net revenue had increased by 41 per cent during the year.

Madras Electric Supply Corporation, Ltd.—At the annual meeting, Mr. James Gray said that the shipping difficulties had been greater than ever, restricting their obtaining essential materials, but they had made steady and satisfactory progress. When conditions improved there would be a considerably increased demand for lighting and power. The total costs per unit in 1917 had been 1.07d., against 1.06d. in 1916. Owing to higher prices of wages, coal and materials there would be further increase in costs in the current year. After referring to the financial results, Mr. Grav said that the supply for Kilpauk was now available, but it might be some time before they obtained full advantage of the extension owing to difficulty of procuring fans and material. They believed that the progress of the last two years would be maintained. The position would be greatly strengthened if they secured sanction for their renewed application for leave to increase the flat rate for lighting and fans from four annas to five annas.

Power Gas Corporation, Ltd.—A petition for confirming the reduction of capital from £300,000 to £280,000 is to be heard on July 30th.

Bournemouth & Poole Electricity Supply Co., Ltd.—Interim dividends on the 4½ per cent. preference shares and the 6 per cent. second preference shares, less income-tax, for the half-year, and an interim dividend on the ordinary shares at the rate of 5 per cent. per annum, less income-tax.

Metropolitan Electric Supply Co., Ltd.—Interim dividend 2 per cent. per annum (1s. per share), less tax, on ordinary shares.

Metropolitan Railway Co.—Dividend at the rate of 3½ per cent. per annum for the past half-year on the deferred stock.

Stock Exchange Notices.—Application has been made to the Committee to allow the following to be quoted in the Official List:—

Henley's (W. T.) Telegraph Works Co., Ltd.—400,000 6rdinary shares of £1 each, fully paid, Nos. 1 to 400,000, in lieu of the £5 ordinary shares quoted.

Howard & Bullough, Ltd.—250,000 additional ordinary shares of £1 each, fully paid, Nos. 750,001 to 1,000,000.

Stewarts & Lloyds, Ltd.—850,000 deferred shares of £1 each, fully paid, Nos. 1 to 850,000 (special application).

Mather & Platt, Ltd.—Interim dividend 5 per cent., less tax, for half-year ended June.

Liverpool Overhead Railway Co.—Interim dividends for the half-year ending June 30th at the rate of 5 per cent. per annum on the preference shares, and 2½ per cent. per annum on the ordinary shares.

STOCKS AND SHARES.

TUESDAY EVENING.

STOCK EXCHANGE markets have been in buoyant and confident mood on the news of the splendid advance and captures by the gallant French Army. Money has come pouring into the markets; some of it might, perhaps, have been better employed in the purchase of National War Bonds than in the buying that has taken place in speculative ventures. However, investment securities are well represented in the long strings of improvements secured by nearly every department round the Stock Exchange, where jobbers raise the familiar lament that there is more money than stock, and that there is not nearly enough of the latter to satisfy would-be purchasers.

Home Railway stocks have benefited from the generally better tone, and Districts continue to be in prominent favour, with a 10s. rise to 9½. Underground Income bonds recovered to 83, though the shilling shares fell back to 5s. 9d. Most of the steam stocks are strong on the first dividends

On the other hand, British Columbia Electric Railway stocks have weakened in consequence of the very substantial rise in wages granted to employés. The company has received permission to put up its fares, but at present it is doubtful whether this concession will cover the extra cost involved by the increase in the wages bill. The market had been a good one until this was announced, when reaction set in. There is nothing doing in Mexicans; securities connected with that country are amongst the few spots in the Stock Exchange to suffer from neglect and stagnation. Mexico Tramways 5 per cent. bonds are 44½, and the First Mortgage Bonds of the Mexican Light & Power Co. remain at 49.

Shares in the manufacturing companies have gone ahead sharply. Babcock & Wilcox have gained another 3s. 9d. on the anticipation of an early announcement of a bonus, either in shares or cash, probably the former. British Insulated have risen ½ to £2 a share, and British Westinghouse Pref. the same at 2½. Edison Swan £3 paid are higher at 41s. 3d. General Electric Ordinary have added another 30s. to their quotation, although the Preference at 10¼ are 5s. down. There has been considerable demand for General Electric Ordinary on the idea that when the new shares are distributed, the ex rights quotation will render the price attractive and bring in a fresh set of buyers. Moreover, those who claim acquaintance with the company's working declare that it is doing extremely well at the present time. Telegraph Constructions are 10s. higher at 44½. Henleys are quoted for the first time to-day in their new shape as £1 shares instead of the old denomination of £5. The price is 2 to 2½, with buyers about in the market who would probably give 2¾. Most of the shares in companies connected with electric and telegraph work are better, and there is a substantial amount of business doing where sufficient shares come in to enable buyers to be supplied.

The Electric Lighting list is quiet, and the tendency remains on the dull side. This is due to the same set of conditions as that to which we have drawn attention lately. Gas and Electric Lighting companies find their position anything but enviable under the regulations of the Select Committee, and although there has been something of a rally in gas stocks, no support has yet been forthcoming for those concerned with the supply of electricity in London. County of London Ordinary have eased off to 10½, and this is the only change throughout the London list. Para Electric Ordinary drooped to 4, this, in company with other Brazilian issues, being somewhat dull in consequence of the adverse movement in the Rio Exchange. Singapore Electrics eased off to 4s.

Telegraphs and Telephones are firm, with Anglo-Americans better. Attention has been directed to the yield on Anglo-American Deferred, which works out to about 6¼ per cent. on the money, and the stock is thoroughly well secured. With income-tax at 6s. in the £, however, the net return is reduced to 4¾ per cent., which can scarcely be called exciting. Eastern Telegraph Ordinary is 10s. up, and Indo-Europeans at 58½ are holding their dramatic rise of last week.

Great Northerns at 37¼ are 10s. down on the dividend declaration, which, with the bonus, makes 22 per cent. for the year. This compares with 24 per cent. paid in the previous 12 months. The principal feature of the market is the strength of Marconis, the parent shares spurting to 4 on a somewhat tardy recognition of the company's position as disclosed by the recent report. Marconi subsidiaries have gone ahead in sympathy with the others. Americans jumped to 26s. 9d., and Marines to 58s. 6d., while Canadians are steady at 12s., Spanish and General remaining about 11s. Business has been done during the past few days in Anglo-Portuguese Telephone Ordinary at 18s. United River Plates at 7 5/16 are 1/16 better, and Orientals gained a similar attraction at 4 13/16.

Rubber shares are firm, but there is still very little doing in them. Iron and Steel descriptions remain active and strong, taking armament shares under their ascending wing. Victoria Falls keep steady, despite a slight dulness in South Africans caused by seismic disturbances around Johannesburg. The base-metal groups move in consonance with the general trend of other markets.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1916.	Dividend 1917.	Price July 23, 1918.	Rise or fall this week.	Yield p.c.
HOME ELECTRICITY COMPANIES.					
Brompton Ordinary	9	10	6¼	—	£7 13 10
Charing Cross Ordinary	5	4	5½	—	6 3 1
do. do. do. 4½ Pref.	4½	4½	6½	—	6 18 6
Chelsea	3	3	3½	—	7 13 10
City of London	8	8	11	—	7 5 6
do. do. 6 per cent. Pref.	6	6	9¼	—	6 0 4
County of London	7	7	10½	¼	6 17 7
do. do. 6 per cent. Pref.	6	6	10	—	6 0 0
Kensington Ordinary	6	7	8½	—	6 13 4
London Electric	Nil	Nil	1¼	—	Nil
do. do. 6 per cent. Pref.	4	5	8½	—	7 13 10
Metropolitan	3	4	5¾	—	6 8 0
do. 4½ per cent. Pref.	4½	4½	6¾	—	7 4 0
St. James' and Pall Mall	6	9	6¾	—	6 13 4
South London	5	5	7	—	6 13 4
South Metropolitan Pref.	7	7	21/-	—	6 13 4
Westminster Ordinary	7	9	6¾	—	7 7 0
TELEGRAPHS AND TELEPHONES.					
Anglo-Am. Tel. Pref.	6	6	8xd	—	6 6 4
do. Def.	1½	1½	22½	+ ¼	6 14 10
Chile Telephone	8	8	9½	—	4 6 6
Cuba Sub. Ord.	7	7	10	+ ¼	*7 0 0
Eastern Extension	8	8	15¼	—	*5 3 3
Eastern Tel. Ord.	8	8	15⅞	+ ⅛	*5 1 7
Globe Tel. and T. Ord.	7	7	14¼xd	—	*4 17 5
do. do. Pref.	6	6	9xd	—	6 0 0
Great Northern Tel.	24	22	37½	— ½	5 17 4
Indo-European	13	—	58½	—	5 11 1
Marconi	15	20	4¼	+ ¼	5 0 0
Oriental Telephone Ord.	10	10	4¹³/₁₆	+ 1/16	2 3 3
United R. Plate Tel.	8	8	7 5/16	+ 1/16	*5 9 5
West India and Panama	6d.	9d.	1⅛	—	*3 6 8
Western Telegraph	8	8	15¼	—	*5 0 10
HOME RAILS.					
Central London Ord. Assented	4	4	62½	—	6 8 0
Metropolitan	1	1	23¾	+ ¼	4 5 0
do. District	Nil	Nil	19¾	+ ¼	Nil
Underground Electric Ordinary	Nil	Nil	3⅜	+ ⅛	Nil
do. do. "A"	Nil	Nil	5/9	—6d.	Nil
do. do. Income	6	4	88	+ ½	*4 16 5
FOREIGN TRAMS, &c.					
Adelaide Sup. 6 per cent. Pref.	6	6	42	—	6 6 4
Anglo-Arg. Trams. First Pref.	5½	5½	8⅛	+	—
do. 2nd Pref.	5½	—	2¾	—	—
do. do. 5 Deb.	5	5	65	—	7 13 10
Brazil Tractions	—	—	44	+2	—
Bombay Electric Pref.	6	6	9½	—	6 6 4
British Columbia Elec. Rly. Pfce.	5	5	61½	—	8 2 8
do. do. Preferred	Nil	Nil	45	—1½	Nil
do. do. Deferred	Nil	Nil	40¾	—1	Nil
do. do. Deb.	4½	4½	61½	— ½	6 18 3
Mexico Trams 5 per cent. Bonds	Nil	Nil	44½	—	Nil
do. 6 per cent. Bonds	Nil	Nil	36½	—	Nil
Mexican Light Common	Nil	Nil	21	—	Nil
do. Pref.	Nil	Nil	35⅜	—	Nil
do. 1st Bonds	Nil	Nil	49	—	—
MANUFACTURING COMPANIES.					
Babcock & Wilcox	15	15	8½	+ 3/16	8 17 4
British Aluminium Ord.	10	10	11	—	8 6 8
British Insulated Ord.	20	20	2	+ ½	5 0 0
British Westinghouse Pref.	7½	7½	2½	+ 1/16	5 19 6
Callenders	20	20	11½	—	6 11 7
do. 5 Pref.	5	5	4	—	6 5 0
Castner-Kellner	23	20	3 3/16	—	6 16 0
Edison-Swan, fully paid	—	—	3⅛	—	Nil
do. do. 4 per cent. Deb.	4	4	74½	—	5 7 5
Electric Construction	7½	10	1⅛	—	7 12 4
Gen. Elec. Pref.	6	6	10½	— ½	6 2 10
do. Ord.	10	10	2⅝	+1/16	*3 10 0
Henley	25	25	2½	—	5 17 8
do. 4½ Pref.	4½	4½	3¼	—	6 18 2
India-Rubber	10	10	18½	—	*6 4 0
Telegraph Con.	20	20	44½	+ ½	*5 7 8

*Dividends paid free of Income Tax.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

B.T.H. Hand-Operated Rheostats.

We have received from the BRITISH THOMSON-HOUSTON Co., LTD., Rugby, their new descriptive list No. 5,100 on hand-operated starting rheostats for D.C. motors. The Form D rheostat is designed essentially for motors of low power and small armature current. The contact brush is of the "skate" type, pressed on to the contacts by means of a steel spring. In rheostats for motors from 5 to 7.5 H.P. renewable sparking contacts are fitted on the first live step. The line terminals are in the form of clamping pillars. A starting period of 30 seconds is allowed with normal full load current, without undue heating of the resistance coils.

The Form F rheostats are designed for motors of higher power. The contact brushes consist of a carbon portion, to reduce sparking, and a brass portion which carries the current; both these portions are self-aligning and independent of each other. In the larger type of rheostats carbon rollers and laminated short-circuiting brushes are fitted. On every step renewable contacts are fitted which can also be reversed to make use of the under side. Line and armature terminals of

FIG. 1.—FORM D, 3-H.P. RHEOSTAT.

rheostats from 9 to 12 H.P. are in the form of clamping pillars, for larger capacities cable thimbles are provided. A starting period of 45 seconds is allowed. Both forms are constructed to give a wide and positive break in the off position, in which position the brush is thoroughly insulated and rests on a fire-proof slab.

The low voltage release coil is connected in series with the shunt field, except for series wound and variable speed shunt wound motors having a wide range of shunt field current, in which cases the coil is separately excited, and connected in series with an external resistance. The overload release is designed to short-circuit the low voltage coil, and can be set to operate at 100, 125, or 150 per cent. of full load rating. The resistance units can be easily renewed; they are fireproof, with porcelain insulators, and are wound with non-rusting wire.

An American Bosch Magneto with Impulse Starter.

The AMERICAN BOSCH MAGNETO Co., of New York and Plainfield, N.J., which has recently been taken over by the U.S.

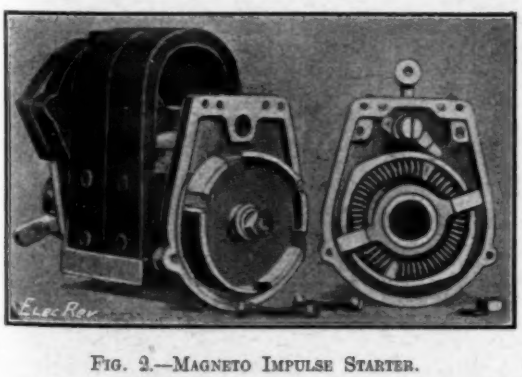


FIG. 2.—MAGNETO IMPULSE STARTER.

Government, has lately adapted an impulse starter to two models of the Bosch high-tension ignition magnetos. As will be seen from the accompanying illustration, fig. 2, it is located between the armature and the driving shaft. On starting up the engine, by the usual starting handle, the armature of the magneto is held stationary by means of a pawl while energy is being stored up by the compression of a series of coil springs. After the driving shaft has been turned through a certain angle the pawl is released by a cam allowing the springs to suddenly open out, the energy which has been stored up imparting a quick rotary movement to the armature resulting in the production of a hot spark sufficient to set the engine working. When the engine attains a speed of 120 R.P.M. the impulse starter is automatically disengaged, the springs then merely acting as a flexible drive to the armature. To set the starter a lever mounted on a spindle projecting from the coil-spring casing at the front has to be set in the operating position either directly or through a suitable linkage. The moving parts of the starter are of steel, the whole being enclosed in a dust-proof aluminium casing integral with the magneto. The heavier part of the starter is carried on its own sleeve bearing, it being consequently claimed that there is no additional strain on the magneto bearings.

The Drayson Petrol Engine and Generator.

We give herewith an illustration (fig. 3) of a new petrol engine and generator set which has recently been introduced by the COMMERCIAL AND MARINE ENGINE Co., LTD., Oak Works, Church Road, Hanwell. The engine, which is mounted on the same bed-plate as the generator, is one of the company's W.O. 45 four-cylinder type, having a bore and stroke of 5 in. × 5½ in., the

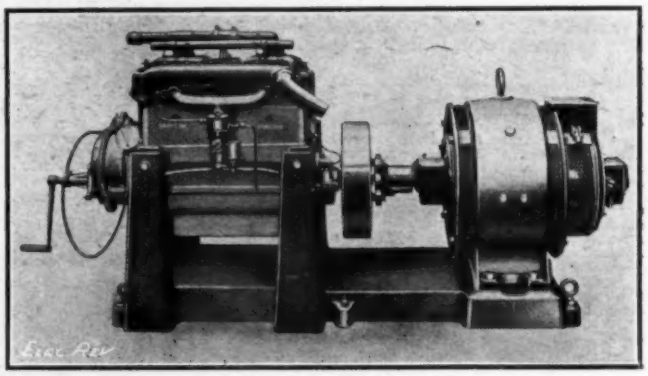


FIG. 3.—THE DRAYSON PETROL ENGINE AND GENERATOR.

engine being rated at 45 H.P. While primarly designed to use petrol as fuel, the engine can by the fitting of a vaporiser be readily adapted to run on paraffin. The details of the engine are all on up-to-date lines, the crankshaft having three large main bearings of chill-cast anti-friction metal. A half-compression device is provided for easy starting, while another feature is the provision of an automatic governor to regulate the speed of the engine. Ignition is by high-tension magneto, while the water circulation and lubrication systems are pump-controlled.

The generator is of the protected, shunt-wound type, having an output of 250 amperes at 110 volts when running at a speed of 1,100 R.P.M. As will be gathered from the picture, it is connected with the engine through a flexible coupling, and the bearings are fitted with end shields.

Electric Cooking and Water-Heating Devices.

In the *Elektrotechnische Rundschau* of March 13th a new cooking device is described in which the heating element is replaced by the water required to cook the food. The device consists of a flat porcelain dish with two electrodes of carbon passing through its base. The current passes from these through the water, which is heated and raised to boiling point. The steam produced rises through a perforated plate until it reaches the food upon which it condenses, after which it falls back into the well where it is again evaporated. This process continues until the food has reached the boiling point after which the water no longer condenses on the food but upon the inside of the lid, from which it flows back into a trough in the lid. When all the water has been evaporated from the well and has collected in the trough the current is automatically interrupted. In this manner the length of time during which the food is cooked can be controlled in advance by filling the well at the beginning with a suitable quantity of water.

The first water heating device described in the *Elektrotechnische Zeitschrift* of March 28th, was designed for use on three-phase circuits, and consists of three sheets of carbon 20×20cm. in area and placed at 10 to 15 mm. apart, and held together by insulating distance pieces. The plates are dipped into the liquid that is to be heated and are used without any series resistance. The apparatus is made suitable for any supply voltage by altering the size of the plates and their distance apart. The carbons have an unlimited life and so the cost of upkeep is very small. 300 lit. of water

can be heated from 8 deg. C. to 40 deg. C. in about an hour. When the water is hot one plate can be disconnected so as to reduce the power taken to a value just sufficient to maintain the temperature of the water.

The second device described is a can through which the water is passed, being heated in its passage. This device works on the same principle as the previous one, but the flat carbon plates are replaced by three carbon cylinders at 5 to 6 mm. distance apart. The cold water is admitted inside the smallest cylinder and rises in the two annular spaces between the three cylinders and runs out hot at the top.

Indicator to Call a Deaf Clerk.—The inventor of this device, described in our last issue, was Mr. E. O. Catford, of the Edinburgh and District Tramways Co., Ltd.

WAR PRICES FOR ELECTRICAL ENERGY.

THE list of increases in the prices of electrical energy published in the ELECTRICAL REVIEW on October 5th, 1917, has been brought up to date so far as the information published in our "Lighting and Power Notes" will allow.

The figures given below are additive, except where otherwise stated. L = lighting, P = power, H = heating, C = cooking, T = tramways, RV = rateable value; where not otherwise specified, the increases are understood to apply to all supplies. In the case of complicated tariffs, only the main features are given. The names of months indicate approximately the quarter in which the increase took place (usually following the month named). Prices in pence are per unit.

ABERDEEN.—Oct., 1915, L. 10 p.c., P.H.C. 25 p.c.
ABERTILLERY.—March, 1916, L. ¼d.; Oct., 1916, L. 1d.
ABERYSTWYTH.—Dec., 1915, 10 p.c.; July, 1916, 10 p.c.
ACCRINGTON.—May, 1915, 20 p.c.; March, 1917, L. 0.2d., H. 0.1d., R.V. 0.1d., P. 10 p.c.; Sept., 1917, R.V. and H. 10 p.c., P. 10 p.c. Cont. rev. prices .06d. plus 10 p.c. Dec., 1917, L. 10 p.c.
ACTON.—May, 1915, 10 p.c.; Nov., 1915, min. per qr. 13s. 4d.
ALDERSHOT.—March, 1916, L. 10 p.c., P.H. rev. prices, 2d.—1½d.; Dec., 1916, rev. prices, L. 6d., P.H. 3d.—2½d.
ALDRINGTON.—June, 1915, ¼d.
ALTRINCHAM.—March, 1918, ¼d.
AMMANFORD.—June, 1918, 1d.
ASHTON-UNDER-LYNE.—March, 1916, L. 10 p.c., P.H. 25 p.c.; Dec., 1916, L. pre-war price plus 1d.; Dec., 1917, L. 15 p.c., D.C. P. 15 p.c., A.C. P. .06d.
ATHERTON.—Dec., 1915, P.H.C. 20—10 p.c.
AYLESBURY.—March, 1916, L. 10 p.c., P. ¼d.; March, 1918, L. 7d. and 1½d.; shop L. 4d., P. 3d. to 1½d.
BACUP.—Dec., 1917, L. 10 p.c., P.H. 15 p.c.; June, 1918, L. 15 p.c.; P. and H. 18.3 p.c.
BANGOR.—June, 1915, L. inc. to 6d.
BARKING.—April, 1915, 10—5 p.c.; Aug., 1916, rev. price, P.H. 1½d. plus 5 p.c., to 1d.
BARNSLEY.—June, 1916, L. ¼d., P. 10 p.c.; Sept., 1917, L. ¼d., P. 15 p.c.
BARNSTAPLE.—June, 1916, inc. to 6d.
BARROW.—Sept., 1915, L.P.H. 10 p.c.; Nov., 1917, L. 20 p.c.
BASINGSTOKE.—Sept., 1917, 15 p.c.
BATH.—Sept., 1915, 10 p.c.; Dec., 1916, 10 p.c.; Sept., 1917, L. ¼d., H. 5 p.c.
BATLEY.—Sept., 1917, L. 7½ p.c., P. 2½ p.c.; Dec., 1917, rev. price, P. and H. 27½ p.c.; June, 1918, rev. price, L. 20 p.c., P. 40 p.c.
BECKENHAM.—June, 1915, 15 p.c.; June, 1916, L. inc. to 7d.; Dec., 1917, L. inc. to 8d., P. and H. ¼d.
BEDFORD.—March, 1916, 5 p.c.; Sept., 1916, 5 p.c.; Dec., 1917, L. to 6d. plus 10 p.c., H. 1½d., P. 2d. to 1½d.
BELFAST.—July, 1915, L. ¼d., P. ½d.; July, 1917, ¼d.; June, 1917, ¼d.
BEXHILL.—Sept., 1915, 10 p.c.; July, 1916, 5 p.c.; March, 1918, 10 p.c.
BIRKENHEAD.—Dec., 1915, 7½ p.c.; March, 1916, rev. prices, L. 4d., P.H. 1½d. to 1d., plus 10 p.c.; March, 1917, L. 5 p.c.; March, 1918, L. 12½ p.c., P. 10 p.c.
BIRMINGHAM.—March, 1916, L. 15 p.c., P. 20 p.c.; Dec., 1916, L. 15 p.c., P. 10 p.c.; Sept., 1917, 15 p.c.; March, 1918, P. L.T. 15 p.c., H.T. and T. 10 p.c.; June, 1918, P. L.T. 5 p.c.
BISPHAM.—Jan., 1917, rev. price, P. 2d.
BLACKBURN.—Oct., 1915, 15 p.c.; Dec., 1917, 10 p.c.
BLACKPOOL.—June, 1915, 10 p.c.; June, 1917, rev. prices, L. 4½d., or 7d. and 2d., P. 3½d. and 1d., H.C. 1d.—1½d.; March, 1918, 5 p.c.
BOGNOR.—Nov., 1916, 1d.
BOLTON.—May, 1915, L. ¼d., P. 10 p.c.; Sept., 1917, L. and P. .1d., T. .04d.; June, 1918, .15d.
BOOTLE.—June, 1916, 12½ p.c.
BOURNEMOUTH.—Sept., 1917, 20 p.c.; Dec., 1917, 5 p.c.
BRADFORD.—March, 1918, 20 p.c., contracts and bulk supply, existing rates plus .015d. p.u. for every 6d. over 9s. cost of coal per ton.
BRAY (WICKLOW).—Sept., 1917, 10 p.c.
BRIDLINGTON.—April, 1916, rev. prices, L. 5½d.—4d., H. 2d.—1½d.; March, 1918, L. 1½d., H.C. ½d., P. 2½d.—2d.
BRIGHTON.—March, 1915, L. ¼d.; m.d. 6d. and 2d. raised to 6d. and 3d., public lighting, ¼d., P. 0.1d.; Oct., 1915, L. ¼d., P. 0.15d., T. 0.05d.; March, 1916, rev. prices, L. 6½d.—4d., P. 1½d.—1¼d.; June, 1917, 10 p.c. (T. 0.1d.); March, 1918, 15 p.c.
BRISTOL.—April, 1917, L. 22½ p.c., P. 45 p.c., contract 37 p.c.
BROADSTAIRS.—Sept., 1915, 10 p.c.
BROMLEY (KENT).—July, 1915, 10 p.c.; June, 1918, L. inc. to 8d., P. 4d.—2d.
BURNHAM (SOMERSET).—Dec., 1916, 1d.; Dec., 1917, L. inc. to 7d.
BURNLEY.—Aug., 1915, rev. prices, L. 3½d., H. 1½d., P. plus 5 p.c.; March, 1916, L.H.C., ½d., T. 0.05d., P. 5 p.c.; Sept., 1917, L. ¼d., P.T. .12d.
BURTON-ON-TRENT.—March, 1916, 15 p.c.; Dec., 1917, 10 p.c.
BURY (LANCS.).—June, 1915, L. 10 p.c., P.H. 15 p.c.; June, 1916, L. 5 p.c., P.H. 10 p.c.; Sept., 1917, 5 p.c., making total L.H.T. 20 p.c., P. 30 p.c.; June, 1918, 10 p.c.
BUXTON.—Sept., 1917, 20 p.c.
CANTERBURY.—May, 1916, ¼d.
CARDIFF.—March, 1917, 5 p.c.
CARLISLE.—Sept., 1917, 10 p.c.; Dec., 1917, 10 p.c.; March, 1918, 5 p.c.
CATERHAM.—July, 1916, rev. price, 7d.
CHATHAM.—March, 1915, 20 p.c.; March, 1916, 13½ p.c.; Sept., 1917, rev. prices, L. 6d., P. 1½d., H. 4½ p. qr., spl. rates 10 p.c.
CHELTENHAM.—June, 1917, 10 p.c.; Dec., 1917, 10 p.c.
CHESTER.—Dec., 1915, 15 p.c.
CHESTERFIELD.—Aug., 1915, 12½ p.c.; Nov., 1917, 12½ p.c.
CHICHESTER.—Dec., 1915, 1d.
CHISLEHURST.—July, 1915, 10 p.c.
CLONES.—Oct., 1915, ½d.
COLCHESTER.—July, 1915, ½d.; Dec., 1917, street L. 10 p.c.
COLNE.—June, 1915, P. ½d.; March, 1917, increase; Dec., 1917, L. ½d., P. ½d.
COLWYN BAY.—June, 1916, ½d.
CONISTON.—May, 1917, 2d.
COKE.—June, 1915, 10 p.c.
COVENTRY.—July, 1916, P. 2 to 10 p.c., according to price of coal.
CREWE.—June, 1916, 10 p.c.; June, 1917, 15 p.c.; June, 1918, 12½ p.c.
CROMER.—Dec., 1917, L. inc. to 4d.
CROYDON.—March, 1915, ½d.; June, 1916, 10 p.c.; Dec., 1916, rev. price, P. 2½d. to 600 units, 1d. over; Sept., 1917, 15 p.c.; March, 1918, L.H.P. 25 p.c., making 50 p.c.
DALKEITH.—July, 1915, rev. price, L. 5½d., P.H. 2d.; July, 1916, L. ½d., P. special charge.
DARLINGTON.—June, 1915, L. ½d., P. ½d.; Nov., 1917, P. 1/16d.
DARTFORD.—Sept., 1915, L. 1d. and ½d., P. ½d.; March, 1916, 20 p.c.; July, 1917, L. 10 p.c., P. 15 p.c.; Dec., 1917, L.P. 10 p.c.
DARWEN.—June, 1915, L. 10 p.c., P. 20 p.c.; June, 1916, P. 5 p.c.; June, 1917, 5 p.c.; Dec., 1917, 10 p.c.; March, 1918, 20 p.c.
DAWLISH.—Aug., 1916, L. 10 p.c.
DENNY.—Sept., 1916, L.P. ½d.
DERBY.—Nov., 1915, 10 p.c.; Nov., 1917, 10 p.c.
DEWSBURY.—June, 1915, L. 10 p.c., R.V. 12 p.c., P.H. 15 p.c.; June, 1917, L. and R.V. 2½ p.c., P.H. 10 p.c.
DONCASTER.—Dec., 1917, rev. prices, 25 p.c. inc.
DORKING.—Dec., 1917, rev. prices, 20 p.c. inc.
DOVER.—Sept., 1916, ½d.
DUBLIN.—March, 1915, L. ½d., P. ½d.; Dec., 1917, L. ½d., P. ½d.
DUDLEY.—Dec., 1917, 12½ p.c.
DUNDEE.—June, 1917, L. ½d., P. ½d.
DURHAM.—June, 1915, 0.02d. for every 6d. above 7s. cost of coal per ton.
EALING.—Aug., 1916, 33.3 p.c.; March, 1918, rev. prices, L. 8d., C.H. 1½d.
EASTBOURNE.—March, 1916, L. ½d.; Sept., 1916, L. ½d.
EAST HAM.—Dec., 1915, 10 p.c. (T. 5 p.c.); June, 1917, 10 p.c. (T. 5 p.c.); Dec., 1917, 13⅓ p.c. (T. 10 p.c.); June, 1918, L. 4d. plus 33.3, m.d. 5½d. and 2½d. plus 33.3, contractors 2d. plus 33.3, P. and H. 1½d. plus 33.3 to 1½d. plus 33.3, special rates inc. ½d. plus 33.3 p.c.; March, 1918, i. 1.0025d. plus 33.3 p.c.
ECCLES.—Sept., 1915, L. 10 p.c., P.H.C. 20 p.c.; Dec., 1916, L. 15 p.c., P.H.C. 5 p.c.
EDINBURGH.—July, 1915, L. ½d.; Aug., 1917, L. ½d., P. 5 p.c.; Nov., 1917, L. ½d.; May, 1918, rev. prices, L. 3½d., P. 1½d. plus 20 p.c.
ELLAND.—July, 1915, P. 12½ p.c.; Aug., 1916, L. ½d., P. 7½ p.c.
EPSOM.—March, 1916, 25 p.c.; March, 1916, rev. prices, L. 7d., P. 3½d., P.L., 4½d.
ERITH.—Sept., 1915, L. ½d., P. 10 p.c.
EXETER.—June, 1916, L. 1d.; June, L.18, L. 10 p.c., P.T. and Pub. L. 15 p.c.
FALKIRK.—April, 1915, 30 p.c.; Sept., 1917, L. ½d., P. .075d.; Feb., 1918, rev. prices, L. 6d.—4½d., P. 4½d. and special rates.
FARNHAM.—Dec., 1916, rev. prices, L. 8d., P.H.C. 4d. (restricted).
FAVERSHAM.—Oct., 1915, ½d.; Sept., 1917, ½d.; June, 1918, rev. prices, L. 6½d.—6d., P. 3d.
FINCHLEY.—June, 1916, L. 20 p.c., P. 10 p.c. and scale.
FLEETWOOD.—Sept., 1915, 10 p.c.; June, 1918, 25 p.c.
FRINTON-ON-SEA.—March, 1918, L. inc. to 9d.
GREAT YARMOUTH.—July, 1915, ½d.; Dec., 1915, ½d.
GILLINGHAM.—April, 1915, L. ½d.; Dec., 1915, H. ½d. plus 10 p.c.; Oct., 1916, 15 p.c.; Sept., 1917, 10 p.c.; Dec., 1917, L. 10 p.c., H.C.P. 20 p.c.
GLASGOW.—June, 1917, rev. prices, L. 5d. and 1½d. or 4½d., P. 2d. and 1d. and scale, H. 1½d. or 1d., KW. charge inc. 15 p.c.; Aug., 1917, .075d.; Nov., 1917, .10d., KW. charge inc. 15 p.c.
GLOUCESTER.—July, 1916, 20 p.c.; June, 1917, 13.3 p.c.
GODALMING.—June, 1918, L. to 8d., P. and H. 10 p.c.
GRANTHAM.—June, 1916, 20 p.c.; June, 1918, P. and H. 20 p.c.
GRAVESEND.—March, 1916, 25 p.c.
GRAYS.—June, 1915, 10 p.c.; June, 1916, 15 p.c.; July, 1917, 8.3 p.c.
GRIMSBY.—Oct., 1915, ½d.; Dec., 1917, 15 p.c.
GUILDFORD.—Sept., 1915, L. 10 p.c., P.H.C. 20 p.c.
HALIFAX.—Sept., 1916, P. 17½ p.c.; Dec., 1917, L.H. 12½ p.c., P. 20 p.c.
HAMPTON.—July, 1916, 20 p.c.
HARROGATE.—June, 1918, 25 p.c.
HASLINGDEN.—June, 1917, rev. prices, L. 4½d., P. and H. 15 p.c.; Dec., 1918, L. ½d., P.H. 10 p.c., T. flat rate 1½d.
HASTINGS.—Sept., 1915, L. 10 p.c.; Dec., 1915, 10 p.c.
HEBDEN BRIDGE.—Dec., 1916, L. 20 p.c.; P. 25 p.c.; Dec., 1917, L. 8½ p.c., P. 20 p.c.
HECKMONDWIKE.—June, 1915, 10 p.c.; July, 1917, 33.3 p.c., making L. 6d., P. 2d. and 4d.
HEREFORD.—May, 1915, 10 p.c.; May, 1916, 25 p.c.; Dec., 1917, L. 10 p.c., P. 10 p.c.
HESTON AND ISLEWORTH.—March, 1917, 25 p.c.
HEXHAM.—June, 1915, L. 1d.; Sept., 1916, L. 1d., P. ½d.
HEYWOOD.—May, 1915, 10 p.c.; Dec., 1915, L. 5 p.c., P. 10 p.c.
HIGH WYCOMBE.—June, 1915, 10 p.c.
HORNSEY.—March, 1916, 10 p.c.; Dec., 1917, rev. prices, 40 p.c. inc. on pre-war prices.
HORSHAM.—March, 1917, rev. prices, L. 6d., P.H. 2d.; Dec., 1917, price increased.
HOVE.—Sept., 1915, 20 p.c., P. 10 p.c. or flat rate 2d.
HUDDERSFIELD.—June, 1915, 12½ p.c.; Sept., 1916, 12½ p.c.; March, 1918, 12½ p.c.
HULL.—Dec., 1915, L. ½d., P.H. 15 p.c.; Dec., 1917, L. ½d., P.H. 17½ p.c.
ILFORD.—March, 1916, 12½ p.c.; June, 1918, L. 6d. or 8d. and 3d. and 4d. and 2d., R.V. plus 1½d. plus 50 p.c., P. 4d. to 2½d., H. 2½d., special rates 25 p.c.
ILKESTON.—March, 1916, rev. prices, L. 4d., P. 2½d.—1½d., H. 1½d.
IPSWICH.—June, 1915, L. ½d., P.H.C. and R.V. 10 p.c.; March, 1916, L. ½d., P.H.C. 15 p.c.; Dec., 1917, rev. prices., L. 6d., R.V., H.C. inc. 50 p.c. on pre-war prices.
ISLE OF WIGHT.—June, 1918, rev. prices, L. 8d., P.H. 10 p.c.
LYMINGTON.—June, 1918, L. inc. to 8d.
KEIGHLEY.—Sept., 1915, ½d.
KENDAL.—June, 1915, L. 1d., P. ½d.
KESWICK.—June, 1916, L. 10 p.c.
KETTERING.—June, 1915, P. 10 p.c.
KINGSTON-ON-THAMES.—April, 1915, rev. prices, L. 5d. or 7½d. and 3½d., P.H.C. 1.65d.; April, 1916, rev. prices, L. 6½d.—4½d., P.H.C. 1½d.—1d.; Dec., 1917, P. 1½d.
KING'S LYNN.—July, 1915, L. ½d., P. 5 p.c.; Jan., 1916, P. 5 p.c.; Dec., 1917, L. ½d., P.H. 7½ p.c.
KIRKALDY.—Nov., 1917, L.P. 50 p.c. on pre-war prices.
LANCASTER.—April, 1916, ½d.; April, 1917, L.P. 22 p.c., T. 12½ p.c.; Dec., 1917, 25 p.c.
LEEDS.—March, 1918, 10 p.c.
LEEK.—June, 1915, 10 p.c.; June, 1918, rev. prices, L. 5d. plus 40 p.c., P. 2d.—1½d. plus 50 p.c., or KW. charge plus ½d. plus 50 p.c.
LEICESTER.—July, 1915, L. ½d., P. 20 p.c.; March, 1917, L. 1d., P. 15 p.c.
LEIGH (LANCS.).—June, 1917, L. 15 p.c.
LEITH.—Sept., 1917, L. ½d., P. ½d.
LEYTON.—March, 1916, L.P.H. 15 p.c., T. 5 p.c.; Dec., 1917, rev. prices, L.P. 33⅓ p.c. over pre-war prices, T. 10 p.c.
LINCOLN.—Dec., 1916, L.P. 20 p.c.; Sept., 1917, L.P. 10 p.c., contract 5 p.c.
LIVERPOOL.—Dec., 1915, 12½ p.c.; March, 1918, 17½ p.c.
LLANDRINDOD WELLS.—July, 1916, 1d.
LLANDUDNO.—Aug., 1915, ½d.
LONDON COMPANIES.—
Brompton & Kensington.—Sept., 1917, total inc. 20 p.c., ckg. 1d.
Charing Cross, West End & City.—June, 1916, rev. prices, 5d., 4d. & 2d.; June, 1918, rev. prices, 6d.
City of London.—March, 1915, P. 10 p.c.; March, 1916, 10 p.c.; June, 1917, public lighting 15 p.c.; Dec., 1917, L.H. 10 p.c., P. 10 p.c.; June, 1918, rev. prices, all charges 50 p.c. increase on pre-war rates.

Kensington & Knightsbridge.—Dec., 1916, rev. price 5½d.; June, 1918, L. 10 p.c.
London Electric Supply Corporation.—Sept., 1917, total increase from 20 to 30 p.c.
Metropolitan Electric Supply Co.—Sept., 1917, total inc. 20 p.c.
Notting Hill Electric Supply Co.—March, 1915, ½d.; Sept., 1916, ½d.; total inc. 20 p.c.
South London Electric Supply Corp.—Dec., 1915, 9 p.c.; Dec., 1917, P. 11 p.c.
South Metropolitan.—March, 1915, 10 p.c.; June, 1918, rev. prices, 6d. plus 10 p.c.

LONDON BOROUGH COUNCILS.—
Battersea.—Sept., 1915, 10 p.c.
Bermondsey.—June, 1917, L. 40 p.c., P. 50 p.c.
Bethnal Green.—Sept., 1917, 33.3 p.c.
Fulham.—March, 1915, 5 p.c.; Dec., 1915, rev. prices, L. 4d., P. 1½d.; March, 1917, 5 p.c.; May, 1917, new system, plus 0.0075d. p.u. for each 6d. over 13s. cost of coal per ton; March, 1918, rev. prices, all charges increased 50 p.c. as compared with 1914.
Hammersmith.—Sept., 1917, L.P. 12½ p.c.
Hampstead.—Sept., 1916, 10 p.c.; Dec., 1916, 23.3 p.c.; Sept., 1918, 16.7 p.c.
Islington.—Dec., 1916, 25 p.c.; March, 1918, rev. prices, 1d. p.u. and under 50 p.c. inc. on 1914 prices, above 1d. p.u. 33.3 inc., public lighting, 1.75d.
Poplar.—March, 1916, P. and public lighting 10 p.c.; Sept., 1917, 10 p.c.; Dec., 1917, P. and public lighting 15 p.c., L.H.C. 10 p.c.
St. Marylebone.—Sept., 1915, 10 p.c.
St. Pancras.—June, 1915, 10 p.c.; Sept., 1917, reduced to 2½ p.c.
Shoreditch.—March, 1917, L.P.H. 25 p.c.
Southwark.—Jan., 1917, total increase equal 4.. 30 p.c., P. 50 pc..; Sept., 1917, rev. prices, L. 6d.—3d., two rate L.P. 8d. and 2d.; March, 1918, P.L.H. 20 p.c., contracts, 33.3 p.c., limit of coal clause to be 15s. per ton instead of 20s.
Stepney.—Sept., 1917, 50 p.c.; March, 1918, special rate ½d. plus 50 p.c.
Woolwich.—March, 1915, ½d.; Nov., 1917, L. (except factory) 1½d., P. ½d.—½d.

LONG EATON.—June, 1915, rev. prices, L. 4d., factory 3½d. and 2½d., P. 1½d. and 0.85d., H. 1d.
LOUGHBOROUGH.—Sept., 1915, 12½ p.c.; Dec., 1916, 12½ p.c.; June, 1917, factory L. 1d., kinemas 1½d.; Dec., 1917, P. 10 p.c.
LOWESTOFT.—March, 1916, L.H. 10 p.c.; May, 1917, L. ½d., P.H. 10 p.c.
LYNN.—Dec., 1917, L. ½d., P.H. 7½ p.c.
MAIDENHEAD.—Sept., 1915, L. ½d., P. 10 p.c.; April, 1916, L. ½d., P. 10 p.c.; July, 1917, L. 1d., P. 10 p.c.
MAIDSTONE.—Dec., 1914, P. ½d.; April, 1915, L.H., ½d.; Dec., 1915, L. ½d.; March, 1916, H. reduced to 1d.; June, 1916, rev. prices equal 25 p.c. inc. on original prices; Aug., 1917, L. ½d., T. ½d., other 10 p.c.
MALTON.—March, 1916, 20 p.c.
MALVERN.—May, 1915, 1d.
MANCHESTER.—May, 1915, L. 10 p.c., P. 15 p.c., R.V. from 12 to 15 p.c.; Dec., 1917, L.P.H., 20 p.c.
MANSFIELD.—June, 1918, 25 p.c.
MERTHYR TYDFIL.—June, 1915, rev. price, 4½d.
MEXBOROUGH.—July, 1916, rev. price, L. 4d.
MIDDLETON.—June, 1915, L. ½d., P. 12½ p.c.; March, 1916, L. ½d., P.H. 12½ p.c.; Dec., 1917, L.P. 12½ p.c.
MIRFIELD.—May, 1915, P. and public lighting, 10 p.c.
MORECAMBE.—June, 1917, rev. price, P. 5d.; March, 1918, L.P. ½d.
MUSSELBURGH.—May, 1918, 2d.
NELSON.—Dec., 1917, L. ½d., P. ½d.; March, 1918, L.P. ½d.
NEWCASTLE-UNDER-LYNE.—May, 1916, L. 5 p.c., P. 16.7 p.c., P. 20 and 10 p.c.; Oct., 1916, rev price, L. 7½d.
NEWPORT (MON.).—June, 1915, 20 p.c.; June, 1917, 10 p.c.; Dec., 1917, 15 p.c. (except contracts).
NEWQUAY.—Dec., 1915, rev. price, 7d.; March, 1918, 3d.
NEWTON ABBOTT.—July, 1915, 16 p.c.
NORTHAMPTON.—Sept., 1915, L. 10 p.c., P. 7½ p.c.; Sept., 1916, L.H. 10 p.c., P. 12½ p.c.; June, 1917, 10 p.c.; Dec. 1917, 10 p.c.
NORTHWICH.—June, 1916, 10 p.c.; June, 1917, rev. prices, 7d. and 4½d., flat rate 6d.
NORWICH.—Dec., 1917, L.H. 5 p.c., P. 10 p.c.
NOTTINGHAM.—Nov., 1917, 7½ p.c.
NUNEATON.—June, 1917, 20 p.c. (P. 10 p.c.); Sept., 1917, total inc. 33.3 p.c.
OBAN.—Sept., 1917, L. 1d., P. ½d., H. ½d.
OLDHAM.—Dec., 1917, L. (except flat rate) 15 p.c., H.C. (except cotton mills), 15 p.c.
ORMSKIRK.—Nov., 1915, L. 10 p.c.; March, 1918, L.H.P. 10 p.c.
OXFORD.—June, 1916, 20 p.c.; March, 1918, rev. prices, L. 8d.—1d.
PEMBROKE (DUBLIN).—March, 1915, L. 5 p.c.; June, 1918, L. ½d., P.H.C. ½d.
PERTH.—Aug., 1916, L. 12½ p.c., P. 5 p.c.; Aug., 1917, 40 p.c.
PETERBOROUGH.—Sept., 1915, P. ½d.; Oct., 1915, 10 p.c.; Sept., 1917, total increase 20 p.c.
PONTYPRIDD.—June, 1918, 10 p.c.
PORTSMOUTH.—Dec., 1917, total increase will equal L. 30 p.c., P.H. 45 p.c.
PLYMOUTH.—Sept., 1915, L. ½d.
PRESTON.—June, 1915, L. ½d.
QUEENBOROUGH.—Dec., 1915, 15 p.c.
RADCLIFFE.—Sept., 1915, L. 10 p.c., P.H. 15 p.c.; July, 1916, L. 5 p.c., P.H. 10 p.c.
RAMSGATE.—Sept., 1918, rev. prices, L. 8d., P. 4d.—2d. plus 20 p.c.
RATHMINES.—June, 1916, L. ½d., P.H. ½d.
RAWTENSTALL.—June, 1916, P. 5 p.c.; Dec., 1917, L. 25 p.c., H. 60 p.c., P. 33.3 p.c., also coal clause, public lighting 25 kw. installed plus 2d.—½d.
RUNCORN.—March, 1918, rev. price 8d.
REIGATE.—March, 1916, L.P. 15 p.c., H. ½d. plus 15 p.c.; April, 1917, 18.7 p.c.
RICHMOND (SURREY).—April, 1915, 10 p.c.; Nov., 1916, rev. price, 4½d.
ROCHDALE.—June, 1915, L. 10 p.c., P.T. 15 p.c.; May, 1917, L. 10 p.c., P. 3d. instead of 15 p.c. Also coal clause. Nov., 1917, L. 13.3 p.c., P. 1d., T. .25d.; May, 1918, L. 17.6 p.c., P. 4d.
ROTHERHAM.—July, 1915, L. ½d.; Sept., 1917, P.H. 20 p.c.; March, 1918, P. 13.3 p.c.
ROWLEY REGIS.—Aug., 1916, 20 p.c.
ST. ANNES-ON-SEA.—June, 1915, L. ½d., P.H. 10 p.c.; April, 1917, inc.
ST. HELENS.—June, 1915, L. 10 p.c.; July, 1916, 10 p.c.; Dec., 1916, 10 p.c.; April, 1917, 10 p.c.; Sept., 1917, 10 p.c.
SALFORD.—June, 1915, L.P. 7½ p.c.; March, 1916, L. 2½ p.c., P. 7½ p.c.; Nov., 1917, L. 10 p.c., P. 10 p.c.
SCARBOROUGH.—June, 1915, L. 10 p.c.; Dec., 1917, rev. price, L. 7d., P. 2½d., H.C. 1½d.
SHEFFIELD.—July, 1916, prices over 2d., 10 p.c.; under 2d., 20 p.c.; Dec., 1917, prices under 2d., 5 p.c.
SHIPLEY.—June, 1915, rev. prices, L. 4½d., P. 10 p.c.; March, 1916, P. 10 p.c.; Dec., 1917, L. ½d., P. flat rate ½d., sliding scale 25 p.c.; June, 1918, L. 1d.
SHREWSBURY.—March, 1916, 20 p.c.; June, 1917, 13.3 p.c.
SLEAFORD.—March, 1917, L. ½d., P. ½d.; June, 1918, ½d.
SOUTHAMPTON.—June, 1916, 10 p.c.; Sept., 1916, 10 p.c.; Dec., 1917, 20 p.c.
SOUTHEND-ON-SEA.—June, 1917, L. ½d., P. ½d.
SOUTHPORT.—June, 1915, 10 p.c.; June, 1917, 5 p.c.; Dec., 1917, 5 p.c.
SOUTHWOLD.—March, 1916, 20 p.c.
SPENBOROUGH.—June, 1915, rev. prices, L. 4½d., P.H. 2½d. and 1½d.; April, 1917, rev. prices, L. 5½d., P. 2½d.; March, 1918, L. ½d. plus 10 p.c., P. ½d.—½d. plus 10 p.c., special rates 50 p.c.
STAFFORD.—June, 1916, P. ½d.; Sept., 1916, rev. prices, L. 7½d.; Dec., 1917, L.P. ½d.
STALYBRIDGE.—June, 1916, P. (on prices less than 1d.), 0.1d.; Dec., 1917, rev. prices, L. 4½d.—3d., heating 1½d., theatres and kinemas ½d., cotton mills 5 p.c., P. coal clause increased to 2d.; June, 1918, L. ½d., P. .35d., H.C. ½d.
STAMFORD.—July, 1915, 10 p.c.; June, 1918, P. and H. 10 p.c.
STIRLING.—Nov., 1917, L. ½d.
STOCKPORT.—June, 1915, rev. prices, L. 5d., H. 1½d. (above 25 units, existing rates plus 10 p.c.), P. coal clause.
STOKE-ON-TRENT.—June, 1917, 25 p.c.; Sept., 1917, 8.3 p.c.; Dec., 1917, 6.6 p.c.; March, 1918, 20 p.c.
STOURBRIDGE.—June, 1918, 50 p.c. on pre-war prices.
STOWMARKET.—April, 1917, price inc. from 8d. to 10d.
STRATFORD-ON-AVON.—April, 1916, 1d.; August, 1917, ½d.; Dec., 1917, rev. price 6½d.
STRETFORD.—Aug., 1915, L. 10 p.c., P. 15 p.c.; Oct., 1915, 15 p.c.
SUNDERLAND.—March, 1916, ½d.; March, 1918, H.T. contracts, 15 p.c.
SURBITON.—March, 1916, 1d.; March, 1917, 1d.
SUTTON.—July, 1916, ½d., P.H. ½d.; June, 1918, rev. prices, L. 6d. plus 10 p.c., P.H. ½d.
SWANAGE.—March, 1918, price raised to 10d.
SWANSEA.—Sept., 1915, hours of m.d. inc. from 91 to 137 in winter qr., meter rent adopted; March, 1918, 12½ p.c.
SWINDON.—Sept., 1915, L. 12½ p.c. or ½d., P. 12½ p.c., public lighting and 1. 10 p.c., H.C., ½d.; Sept., 1916, L. ½d.; March, 1918, public lighting, 20 p.c., P. 3d.—1.8d., H. 1½d., T. 1.8d.
SWINTON AND PENDLEBURY.—Dec., 1917, 5 p.c.
TAUNTON.—Sept., 1915, 15 p.c.; June, 1916, 10 p.c.; March, 1917, 8.3 p.c.; June, 1918, 16.6 p.c.
TEDDINGTON.—June, 1916, 20 p.c.
THIRSK.—April, 1916, 20 p.c.
TODMORDEN.—Nov., 1917, rev. price, L. 5d., P.H.C. 10 p.c.
TORQUAY.—Sept., 1916, L. ½d.; June, 1917, ½d.; March, 1918, L. 1d., P.H.C. ½d.
TOTNES.—June, 1918, rev. price.
TROWBRIDGE.—Aug., 1916, 10 p.c.
TUNBRIDGE WELLS.—Sept., 1917, L. 10 p.c., P.H. 25 p.c.
WAKEFIELD.—Sept., 1915, L.P. 12½ p.c.; April, 1916, P. 12 p.c.; Dec., 1917, P. 25 p.c., L. 12½ p.c.; June, 1918, P. 1½ p.c. inc. for each 6d. increase per ton of coal, ¼ p.c. inc. for each 1s. per week inc. to workmen.
WALLASEY.—July, 1915, rev. prices, L. 4d.—3½d., P. 2½d., H.C. 1½d.
WALTHAMSTOW.—June, 1915, 15 p.c.; Nov., 1916, L. 5 p.c., P.H. 10 p.c.; Sept., 1917, L. 5 p.c., P.H. 8.3 p.c.
WALTON-ON-THAMES.—Sept., 1916, rev. price, 7d.
WARRINGTON.—July, 1915, L.T. 10 p.c., H.P. 15 p.c.; July, 1916, 5 p.c.; June, 1917, 10 p.c.; June, 1918 (except tramways), 10 p.c.
WATFORD.—June, 1915, L. 12½ p.c., P. 10 p.c.; Sept., 1916, rev. price, L. 5½d.
WEDNESBURY.—Dec., 1914, 15 p.c.
WEST BROMWICH.—June, 1915, 20 p.c.; Dec., 1915, P. 15 p.c.
WEST HAM.—Sept., 1916, 10 p.c.; Sept., 1917, further 10 p.c.
WEST HARTLEPOOL.—Sept., 1917, 15 p.c.
WESTON-SUPER-MARE.—Dec., 1917, L. ½d., P.H. ½d.; June, 1918, L. 1d., P.H. ½d.
WEYBRIDGE.—June, 1918, P.H. 10 p.c.
WEYMOUTH.—April, 1916, L. 15 p.c., P.H.C. 20 p.c.; Sept., 1916, rev. price, L. 6d.; Dec., 1917, ½d.; Sept. 30th, L. 7d.—2d., military 5d.; fixed price, L. 20 p.c.
WHITEHAVEN.—Dec., 1917, L.P. 20 p.c.
WIGAN.—March, 1917, rev. prices, L. 5½d. to 3½d.; Sept., 1917, rev. prices, P. 2d.—1d., plus 25 p.c.
WIMBLEDON.—March, 1916, 10 p.c.; Sept., 1916, 15 p.c.; Sept., 1917, rev. prices, L. 6d., P.H.C. 2d.
WINCHESTER.—Sept., 1916, 15 p.c.; Dec., 1916, 10 p.c.
WINDERMERE.—June, 1916, 10 p.c.
WINDSOR.—Dec., 1917, price inc. to 8d.
WISBECH.—June, 1916, inc. to 6½d.
WOLVERHAMPTON.—March, 1916, 10 p.c.; Sept., 1917, 10 p.c.; Oct., 1917, P. (1d. p.u. and under) 10 p.c.; Dec., 1917, P. (1d. p.u. and under) 20 p.c., (over 1d.) 30 p.c.; June, 1918, P. (1d. p.u. and under) 10 p.c.
WORCESTER.—Oct., 1915, L.P.H. 10 p.c.; Sept., 1917, 10 p.c.; March, 1918, contracts ½d.
WORKSOP.—Sept., 1915, L. ½d., P. ½d.; May, 1917, ½d.
WORMIT.—March, 1918, L. inc. to 7d., contracts 17 p.c.
WORTHING.—Oct., 1915, L. 10 p.c. or total 5½d.; Jan., 1917, 20 p.c.
WREXHAM.—Dec., 1916, 10 p.c.; Sept., 1917, L.H. 15 p.c., P. 6.7 p.c.
YORK.—March, 1917, L.P. 10 p.c.

NOTES FROM CANADA.

(FROM OUR SPECIAL CORRESPONDENT.)

IN a recent issue of the *Canadian Engineer* there appeared an article on the Chippewa-Queenston power development of the Hydroelectric Power Commission of Ontario which is now in progress. A few extracts showing the salient features of this scheme will, no doubt, be of interest. The actual difference in level between Lakes Erie and Ontario is 330 ft., but only about half of this occurs at Niagara Falls where all the existing power plants are located.

By making a canal from Chippewa, some distance above the Falls, to convey the water, at the higher level, to Queenston, which lies beyond the Rapids, a gross head of 316 ft. will be obtained, and a net head of 205 ft. after deducting friction and other losses; some of the present power houses at the Falls are said to be working under net heads of less than 135 ft. The length of this canal will be 12¾ miles, of which there is a river section (the Welland River) of 4¼ miles, and an excavated section of 8½ miles. The river section will have to be deepened and widened and the flow of the Welland River will be reversed in this section. At the Queenston end of the canal the cliffs forming the Niagara river banks are nearly vertical, so that short penstocks can be utilised; this results in comparatively small cost and little loss of head in the penstocks, and does away with the need of surge tanks.

The canal is designed for a nominal rate of flow of 10,000 cu. ft. per second at minimum low water. The greater portion of the excavation will be in rock, but where earth is encountered it will be lined. The rock section will be 48 ft. wide at the bottom with perpendicular sides; the average wetted section will be 35 ft. deep. The velocity of the water in this portion of the canal will be about 6 ft. per second, maximum; in the earth section the velocity will be less, and the sides will have a considerable slope. The Commission has bought a wide strip of land as a right of way, and, if necessary, two more canals could be constructed on it in the future.

The ultimate capacity of the plant to be installed under the present scheme will be 300,000 H.P., and two-thirds of that amount is being arranged for now; there will finally be six turbines, each of 50,000 H.P. capacity, four of these to be installed at the start. These turbines are larger than any water turbines yet in existence, but it is possible that the first extension from 200,000 H.P. to 300,000 H.P. will be made with a single unit as the Commission has designs for a 100,000 H.P. turbine set already.

The generator voltage will be 12,000 to be stepped up probably to 110,000 volts. The excavating equipment includes two five cubic-yard electrically-driven "Buegous" shovels of 735 H.P. nominal rating each. The weight of each of these shovels is over 400 tons, each has a capacity of 3,000 cubic yards a day when handling earth, and they can load cars standing on tracks 62 feet above the level of the tracks on which the shovels rest. The quantity of earth excavation is estimated to be 11,000,000 cubic yards, and of rock excavation 4,000,000 cubic yards.

The construction railway is double track 12¼ miles long, and is electrically operated. A large jaw crusher which will have a capacity of 20,000 cubic yards of stone per day will be installed. Four railway bridges, besides a number of highway and foot bridges will span the canal at various points. The Commission is carrying out the whole of the work, no contractors being engaged. The estimated total cost is $25,000,000, and it is expected that the plant will be in operation in 1921.

The Commission of Conservation reports that at Sudbury, in Northern Ontario, the British American Nickel Corporation is erecting a new smelter and refinery, so that nickel will in future be treated in Canada instead of in other countries. Some 2,500 tons of ore per day will be handled, and there will be an annual production of nickel of about 10,000 tons. The entire plant will be operated by electric power, which will be supplied by the Hydro-Electric Power Commission of Ontario.

At Port Colborne, Ontario, the International Nickel Co. is also constructing a nickel refinery. This plant, which it is expected will soon be in operation, will turn out 7,500 tons of nickel a year, but future extensions will probably bring this up to 20,000 or 30,000 tons. The tons referred to are "short" tons of 2,000 lb. each.

At Shawinigan Falls an electrolytic plant has been erected for recovering metallic magnesium from magnesite; this metal is used for the manufacture of star shells and flares, and as an alloy with aluminium for aeroplane parts.

There are now in Canada 32 Héroult electric furnaces and 22 of other types, having a capacity of 173,000 tons of iron and steel, 50,000 tons of ferro-silicon, and 8,000 tons of other ferro-alloys per annum.

WATER-POWER IN ITALY.

BY "ULYSSES."

ONE of the effects of the war has been to reveal the present dependence of some countries upon imported coal for the maintenance of their industrial efficiency. France—with her northern provinces in enemy occupation—Holland, Denmark, and Argentina, all have to import coal, and of no country is this truer than Italy, which, according to the British Board of Trade, imported coal from the United Kingdom to the value of £5,234,285 in 1915, and of over £7,800,000 in 1916.

So great has been the shortage of coal in the Peninsula, that we hear of £4 and £5 a ton being cheerfully paid by manufacturers, and the Government has been compelled to forbid the cutting down of olive trees, which fetched a heavy price for firewood in factories. But a remedy close at hand has presented itself in the form of electricity generated by water-power from the numerous streams which flow from the Alps to the sea. The possibility of producing up to 40 million H.P. has been estimated by some enthusiasts in Italy, but, at any rate, 5 to 6 million H.P. is at present virtually assured, given the required capital and machinery, and to-day over 1,000,000 H.P. is actually in use.

A comparison of the water-powers of different countries shows that Germany and Switzerland are leading the world in the use of this power, while Italy, the U.S.A., France, Norway, and Sweden have all developed percentages—up to 17 per cent. in the case of Italy—of their possible water-power output.

In Italy the aspiration is very strong to become independent of coal by the development of their "white coal," and an extensive development of electrical power generated by water has been undertaken by a company called "Società Elettrica Riviera di Ponente," of which Signor Rinaldo Negri is the active managing director.

In 1917 the company increased its capital from lire 20,000,000 to lire 50,000,000 (= about £1,500,000 to-day), and has continued to pay a dividend of 12 per cent. since 1907. It has erected considerable generating stations on the Roja, Argentina, and Maira Rivers, and distributes electric power from the French frontier River Roja right away to Genoa (over 100 miles), and from the Maira River, in the Province of Cuneo, about the same distance to Novi and back to Genoa. The railway line has been electrified between Genoa and Savona (a distance of 30 miles), and it is proposed shortly to do the same for the line from Savona to Ventimiglia, another 50 miles. Travellers along the Riviera, where the endless tunnels, hitherto full of foul smoke, have so spoilt the journey, will welcome this purifying change.

In England we ought to welcome this industrial development in Italy by means of her water-power. The policy of exporting coal—our industrial life-blood—is very questionable; and the more Italy and other countries can develop their own resources, the better purchasers they will be for our manufactures and machinery. But in the meantime, we can learn much from the practical application of electricity to railways and factories, which is making such progress in Italy.

NEW PATENTS APPLIED FOR, 1918.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS. SEPTON-JONES, O'DELL AND STEPHENS (successors to W. P. Thompson & Co., of London), Chartered Patent Agents, 285, High Holborn, London, W.C. 1.

11,177. "Gas generator for mercury interruptors for X-ray, &c., purposes." A. E. DEAN. July 8th.
11,180. "Electrical connector arrangements." R. A. R. BOLTON & J. W. BRIGGS. July 8th.
11,181. "Electric batteries." A. MOND & L. RABINOVITCH. July 8th.
11,197. "Accumulator grids." S. J. WILLIAMS. July 8th.
11,208. "Method of submarine electric lighting or illumination." W. M. MITCHELL. July 9th.
11,219. "Sparking plugs for internal-combustion engines." J. W. T. CADETT & M. E. DIXON. July 9th.
11,231. "Instrument for teaching the Morse alphabet and for transmitting wireless, &c., messages automatically by Morse code." H. H. AYSCOUGH. July 9th.
11,232. "Electric generator." H. H. HAYE, P. RAVEN & F. WEATHERELL. July 9th.
11,252. "Telegraphing apparatus." E. H. KNOWLES. July 9th.
11,279. "Couplings for electrical conductors." H. SIMON, LTD., & H. WILLIAMS. July 10th.
11,296. "Electrical control of gun movements." SOC. ANON. ITALIANA G. ANSALDO & Co. July 10th. (Italy, July 18th, 1917.)
11,301. "Electrical searchlight, &c., projectors." C. A. HUGHES, LONDON ELECTRIC FIRM & W. M. MORDEY. July 10th.
11,304. "Cone heating elements for electric heating apparatus." H. J. C. FORRESTER (Burgess). July 10th.
11,317. "Means for operating magneto in reversible internal-combustion engines." G. M. BLACKSTONE, E. CARTER & F. CARTER. July 10th.
11,336. "Electric lamp flashers." E. C. LEACHMAN. July 10th.
11,340. "Electric motor-starters." C. C. GARRARD, A. H. RAILING & W. WILSON. July 11th.
11,342/3/4. "Sparking plugs for internal-combustion engines." A. T. ELLIS & H. A. HANDS. July 11th.
11,370. "High-tension adjustable jump-spark conductor." F. H. NORRIS AND J. A. G. OGILVIE. July 11th.
11,409. "True-bearing magnetic compass." R. GILLESPIE. July 12th.
11,444. "Electric locomotives or cars." BRITISH THOMSON-HOUSTON Co. (General Electric Co., U.S.A.) July 12th.
11,459. "Instrument whereby short ends of carbon may be held securely in electric arc lights." W. A. GITSHAM. July 12th.
11,474. "Timing mechanism for ignition systems." BOSCH MAGNETO Co. July 12th. (U.S.A., September 26th, 1917.)
11,476. "Impulse starting mechanism." BOSCH MAGNETO Co. July 12th. (U.S.A., September 21st, 1917.)
11,478. "Process for insulation of electric installations." ELEKTRO-MATERIAL GES. July 12th. (Germany, April 11th.)
11,483. "Fixing and supporting devices for tubes, electric wires, &c." G. S. BOOTHROYD AND CALLENDER'S CABLE & CONSTRUCTION Co. July 12th.
11,484. "Leading-in conductors for electric lamp bulbs, &c." NIHON DANKI KOGYO KABUSHIKI KRISHA & T. YANAI. July 12th.
11,485. "Leading-in wires for incandescent electric lamps, &c." K. OHTANI. July 12th.
11,486. "Junction boxes, &c., for electric wiring installations." G. S. BOOTHROYD AND CALLENDER'S CABLE & CONSTRUCTION Co. July 12th.
11,500. "Electrical burglar alarms." G. KIRK. July 13th.
11,515. "Centrifuge electric speed-governor." T. N. C. KORESSOIS. July 13th.
11,525. "Sparking plugs." I. KNASTER. July 13th.

PUBLISHED SPECIFICATIONS.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1917.

7,009. ELECTRIC SWITCHES. F. C. Stockel and Fyfe, Wilson & Co. May 16th, 1917. (116,734.)
8,638. ELECTRIC CONTROLLERS. Edison Accumulators, Ltd., J. F. Monnot and E. W. Lewis. June 15th, 1917. (116,747.)
8,722. REMOVABLE ELECTRICAL FUSE CARRIERS OR CONNECTING DEVICES. British Insulated & Helsby Cables, Ltd., and R. W. Blades. June 18th, 1917. (116,752.)
9,086. TERMINAL SOCKETS FOR ELECTRICAL CONDUCTORS. St. Helens Cable and Rubber Co. & J. C. White. June 25th, 1917. (116,764.)
9,587. ELECTRIC CONDENSERS. F. R. Simms & Simms Motor Units. July 3rd, 1917. (116,780.)
9,594. PRODUCTION FOR COLOUR MUSIC AND APPARATUS THEREFOR. A. B. Hector. July 3rd, 1916. (107,767.)
10,160. ELECTRIC WELDING MACHINES. T. E. Murray. October 23rd, 1916. (111,089.)
10,472. LIFTING MAGNETS. A. West & Co. and L. Satchwell. July 20th, 1917. (116,791.)
12,105. SUPPORTS FOR DEVICES SUCH AS ELECTRIC FANS. F. C. W. Thompson. August 23rd, 1917. (116,805.)
15,541. ELECTRICAL ACCUMULATORS. E. A. Cotte. October 25th, 1916. (111,107.)
18,501. TELEPHONE SYSTEMS. Automatic Telephone Manufacturing Co. December 15th, 1916. (112,026.)
18,505. AUTOMATIC TELEPHONE SYSTEMS. Automatic Telephone Manufacturing Co. & C. F. Tomlins (Automatic Electric Co. in part). December 14th, 1917. (116,849.)

1918.

3,304. AUTOMATIC TELEPHONE SYSTEMS. Automatic Telephone Manufacturing Co. March 19th, 1917. (114,422.)